



RETROCOMMISSIONING PERFORMANCE TRACKING GUIDELINES

Commercial & Institutional Buildings

San Diego Gas and Electric Retrocommissioning Program

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Overview

Immediately after retrocommissioning measures are implemented in a facility, the related building systems are operating at their peak performance and maximum savings are being realized. Over time, however, the efficiency of the systems may return to pre-retrocommissioning operating conditions unless explicit strategies are put into place to maintain and monitor the improvements.

To ensure that the energy savings and other non-energy benefits from retrocommissioning are long-lasting, the San Diego Gas and Electric (SDG&E) RCx Program offers assistance for the installation of data acquisition equipment in the building. This assistance is used to track the performance of the retrocommissioned equipment and the analysis of performance data for a period of one year after implementation of the measures. The data is gathered and analyzed to help ensure the persistence of savings and to assist the building staff in addressing any issues regarding changes in equipment performance and operation.

Buildings are selected for performance tracking by the Program through a screening process, with assistance from the RCx Provider. The main purpose of this screening is to assess the implemented measures' risk of falling out of persistence as well as to determine if the building control system has the necessary capability for participation in the Performance Tracking Program. The building automation system (BAS) plays a large role in performance tracking, and a building's eligibility for the Program is somewhat dependent on the capability of the BAS – trending capability, age, user interface, etc. The Program will complete a scorecard for each project as part of its screening process, with assistance from the RCx Provider.

Other factors are also considered in the building selection process, and below is a summary of the criteria that may be evaluated:

- Energy savings resulting from implemented RCx measures
- Number of measures that can easily be tracked through the BAS. Measures that relate to equipment that is not controlled by the BAS, such as a pump impeller trim or replacing a faulty stand alone timeclock, would not be good candidates for performance tracking.
- Owner and building staff cooperation throughout the RCx process
- Building operator and controls contractor participation and familiarity with the BAS

The PECCI Program Representative will give the building owner an overview of the Persistence Tracking Program and outline the owner's responsibilities while participating in the Program. A *Performance Tracking Agreement* will then be signed, validating the owner's commitment to the Program and willingness to work with the selected Performance Tracking Provider (PT Provider). Usually the best candidate for the PT Provider is the retrocommissioning (RCx) provider, who has a good understanding of the building and its systems, and of the RCx measures that were identified and implemented.

The PT Provider will hold a planning meeting with the owner and appropriate facility staff to discuss systems-level performance tracking system options, determine which implemented RCx measures will be tracked, and discuss any facility access and security issues in which the PT Provider would need to gain access to the BAS trend data remotely.

The role of the PT Provider is to develop a *Performance Tracking Plan*, oversee the installation of the performance tracking system / equipment, assist the building owner / staff in identifying operational and performance problems detected through analysis of the performance tracking data, and provide follow-up



documentation, including *Quarterly Reports* and a *Final Report* detailing overall persistence at the conclusion of the project.

1.0 Incentives

The performance tracking incentive is paid to the PT Provider by PEGI through six installments. Up to 30% of the incentive will be paid after the performance tracking system has been installed and verification documentation has been reviewed and approved by PEGI. Up to 10% of the incentive will be paid to the PT Provider after the submission of each of the four *Quarterly Reports*. The remaining incentive will be paid to the PT Provider after the *Final Report* has been reviewed and approved by PEGI.

The performance tracking incentive amount will depend on the level of monitoring selected, the number of measures and related points being monitored, building size, and the performance tracking technology utilized. Tracking systems with automatic diagnostics may be eligible for a higher incentive than systems that rely on ‘manual’ analysis. The PT Provider will submit a budget with the *Performance Tracking Plan* as described below, that includes a detailed description of the proposed performance tracking technology.

2.0 Performance Tracking Plan

The PT Provider is responsible for developing a *Performance Tracking Plan* and budget that will clearly address each step of the project, including measure selection, performance tracking system selection, data acquisition and analysis, *Quarterly Reports* and meetings through the entire year of project monitoring, and a *Final Report* and meeting. The PT Provider must provide a time & materials-based budget for the performance tracking work. The *Performance Tracking Plan* and budget must be submitted to PEGI and must be approved before a performance tracking system is purchased and monitoring begins. After the *Performance Tracking Plan* is approved by PEGI, the PT Provider will receive a *Scope of Work* outlining the project deliverables, timeline and incentive structure.

Along with the plan, the PT Provider should submit their qualifications to demonstrate their capability. This can include:

- Past and current performance tracking projects, including types and numbers of buildings, measures tracked, and process utilized for these projects.
- Experience with the performance tracking technology being proposed.
- Involvement with the RCx project for which performance tracking is being considered (i.e., if the PT Provider was the RCx Provider).

If the Provider does not meet the Program qualifications, PEGI will identify another provider to perform the performance tracking.

2.1 Performance Tracking Plan Development

The *Performance Tracking Plan* is intended to be used as a guide for the project progression, from start to finish. An outline of the plan is included in **Attachment A**, and a sample plan is also available for use by the PT Provider. The plan is critical to long-term persistence of savings because it contains details on the performance tracking system used for the project, measures selected for monitoring, details relating to system installation, and recommendations for problem resolution during performance tracking. It is also a resource to building owners and building staff, and is used as a record of the Performance Tracking



system installed in the event the owner wishes to continue these practices beyond the timeline of the project.

To assist with development of the *Performance Tracking Plan*, the Program provides a sample for PT Providers to follow. The *Performance Tracking Plan* must contain the following information:

- Description of measures selected for performance tracking, and annual energy savings associated with each measure. The Program provides guidelines in **Attachment B** to assist PT Providers in appropriate measure selection.
- Description of systems-level performance tracking system and level of monitoring selected for the project
- Detailed list of which points will be tracked
- Definition and calculation methodology of baseline to be used for determining whether measures are persisting. Weather dependencies should be accounted for, where applicable
- Logistics relating to the installation of the selected monitoring system (i.e. locations for any equipment associated with the system, routes for running wire from computer to sensors, possibility to connect to a LAN or wireless network)
- Address how operational / performance problems will be identified and communicated, and the PT Provider's role in assisting the owner / building staff in repairing measure-related issues
- Building operator and owner training on the *Performance Tracking Plan* and results of the on-going monitoring (provided in hands-on discussions and quarterly performance monitoring reports)
- Project budget

The PT Provider must follow the accompanying outline in **Attachment A**, and may use the *Performance Tracking Plan* sample provided by the Program. The template and sample represent the minimum content required for the *Performance Tracking Plan* report; the PT Provider should include any additional information gathered during the PT process that may assist the owner in maintaining the operational improvements.

Once complete, the *Performance Tracking Plan* must be submitted to the Program for review and approval.

3.0 Installation/Implementation of Performance Tracking System

The PT Provider will install (where necessary) and utilize a tracking system to monitor the performance of select retrocommissioned systems toward ensuring persistence of savings realized from implementing retrocommissioning (RCx) measures. These systems-level performance measurement systems will track critical points for monitoring the persistence of improvements, and will provide that information to the PT Provider for analysis and presentation to the Program, building owner, and the building operators.

The systems-level tracking system will be customized to utilize the building's automation system (BAS) as much as possible. The BAS can be used as the tracking system if it includes sufficient data storage and transfer characteristics. Where necessary, a separate systems-level performance tracking system, such as



Architectural Energy Corporation's Enforma Building Diagnostics, may need to be installed for gathering data from the BAS and transferring that data to the PT Provider for analysis.

The performance tracking system should have sufficient trending and storage capability. At a minimum, the system should have the capacity to trend and store three months worth of five minute trends for the number of points proposed for tracking.

The Program requires two key submittals, *Verification Documentation* and *Proof of Payment*, regarding the installation and set-up of the selected performance tracking system. These submittals allow the Program to confirm that the monitoring system is properly installed and is tracking the measures indicated in the *Performance Tracking Plan*. The submittals also assist in updating any costs associated with the system and installation.

3.1 Verification Documentation

Submittal of installation *Verification Documentation* is required to confirm that the performance tracking system was properly installed and set-up to trend the selected measures. Two weeks of tracked data, including all monitored points relevant to the tracked measures, should be submitted to the Program. When applicable, clearly labeled photos (including relevant information, date/time stamp, etc.) should also be submitted.

3.2 Proof of Payment

The PT Provider is required to submit copies of all itemized invoices indicating installation date, installer company info, installed equipment/procedure, and cost.

4.0 Measure Performance Tracking

The PT Provider will track the selected measures for a period of one year. Trend data will be gathered and analyzed at least quarterly, and the results will be communicated with the owner and the Program. These results will be discussed and follow-up action will be determined for those measures that are not persisting. This process will help ensure persistence of savings for the implemented RCx measures.

The PT Provider is responsible for educating the owner and building operators on the selected Performance Tracking system and its capabilities throughout the project. This will be achieved by an initial orientation during installation of the system, and then discussions / demonstrations during the quarterly performance tracking meetings.

4.1 Performance Tracking Planning Meeting

The purpose of the initial planning meeting is to give the building owner and operators an overview of available performance tracking systems and to select measures for tracking. The PT Provider should educate the owner on available performance tracking systems, and assist them in determining the best performance tracking system for the proposed project / measures.

4.2 Building Owner and Operator Training

A meeting between the PT Provider, building owner, and operating staff is required to discuss the first *Quarterly Report*. The purpose of this meeting is to educate the building owner and operating staff on navigating the *Quarterly Report* and understanding its contents. The *Quarterly Report* details any



findings identified by the monitoring system for each quarter, and recommends actions that should be taken to repair any issues.

It is important that the building owner and operator understand the importance of these reports and how to interpret them, particularly if trend data is included, in order to ensure the persistence of selected RCx measures.

The PT Provider will communicate with the owner and operating staff following the approval of each *Quarterly Report*. The purpose of these calls is to discuss, in further detail, the results of the *Quarterly Report* and encourage the owner and building staff to take any recommended actions to resolve measure-related issues.

5.0 Follow-up

If problems are suspected during the performance tracking of any measures, the PT Provider will evaluate the data to confirm problems exist and state any issues in the *Quarterly* and *Final Reports*. The Provider should work with the owner to determine the best approach and channels to communicate and resolve issues during performance tracking.

5.1 Quarterly Performance Tracking Reports

At the end of each of the four quarters during the performance tracking period, the PT Provider is responsible for issuing a *Quarterly Report* and holding a check-in call with the owner to discuss the results of the performance tracking. The Report should detail the results of the performance tracking for that time period. This report is submitted to the Program. To assist with the report development, the Program provides a sample for PT Providers to follow. For each tracked measure, the following information should be included in the report:

- Measure description and tracking performed.
- Results of quarterly performance tracking. This can include a description of the results, tables / graphs of monitored data, or other documentation that will clearly define the performance of the measure.
- Report of measure performance over tracking period.
- If a measure was found to not be persisting, include the estimated energy waste (kWh, kW, therms, cost).
- Recommended action. The PT Provider should recommend action be taken if it is found that the measure is not persisting.
- Follow-up action. If the PT Provider recommends methods that should be taken by the building operator to determine the problem, a follow-up action should also be defined, so that the PT Provider can easily verify that the problem has been addressed during the next tracking period.

The PT Provider must follow the accompanying outline in **Attachment C**, and may use the *Quarterly Report* sample provided by the Program. The template and sample represent the minimum content required for the *Quarterly Report*; the PT Provider should include any additional information gathered during the PT process that may assist the owner in maintaining the operational improvements.



5.2 Final Performance Tracking Report

Upon completion of the project, the PT Provider is responsible for issuing a *Final Report* detailing the results of the performance tracking for the length of the project. This report is submitted to the Program. To assist with the report development, the Program provides a sample for PT Providers to follow. The following information should be included in the report:

- Project summary: this includes a description of the performance tracking system used, measures selected, building information, and savings associated with the selected measures.
- Results summary: this includes a summary of the tracked measures.
- Measure summary: a brief summary of the key results relating to each measure.
- Follow-up steps: outline options for owner's ongoing use of performance tracking software and service beyond scope of program.
- Conclusion
- Summary table of tracking results



Attachment A: Performance Tracking Plan Outline

The Program provides a sample for the *Performance Tracking Plan* and includes the following elements:

1. Program Cover (provided), customize for the facility
2. Table of Contents (provided, update as necessary)
3. Report Contents (see outline below)
4. Budget template

The PT Provider should consider the following outline as the minimum content required and include any additional information gathered during the PT process that may assist the owner in maintaining the operational improvements:

1.0 Project Summary

This section provides an overview of the facility including building characteristics, energy usage patterns, and description of the installed mechanical systems and building automation system.

In addition, a description of the RCx measures selected for performance tracking, including measure description, associated annual savings for each measure, and any additional information that may be related to the proposed monitoring of each measure should be included.

2.0 Performance Tracking System

This section provides information regarding the performance tracking system selected for the project. A system description as well as logistics relating to monitoring each measure with the selected system should be documented here. Some important details that may be included in this section are:

- The location and characteristics of tracking-related equipment and, if necessary, additional computer for data storage;
- Description and location of additional sensors and sensor modules;
- Routing of any required wire from the computer to sensor modules;
- Description of data transfer method (e.g., LAN connection, web-access, wireless modem, read-only connection to BAS).

3.0 Installation / Implementation

This section discusses what necessary steps are required for the successful installation and implementation of the performance tracking system. Details regarding what equipment is required for installation, specifying who will be doing the work, and plans to ensure that equipment was correctly installed and tracking is performing appropriately should be noted in this section.

4.0 Budget

This section includes an itemized breakdown of the performance tracking budget, including hours for each task, hourly rate, subcontractor fees, equipment costs, and travel expenses.

5.0 Problem Resolution



This section will describe the process used when measures are not persisting (*Quarterly Reports*, conversations with building operators). A list of persistence issues can be maintained similar to a commissioning issues log to help keep identified persistence issues current and actionable.

6.0 Project Timeline

An outline of the project schedule and deliverable schedule should be included in the plan. Include dates for the following milestones:

- Planning meeting
- Submission of *Performance Tracking Plan*
- Tracking period schedule, indicating start date, quarterly tracking periods, and end date
- Submission of *Implementation Verification Documentation* and *Proof of Payment Documentation* for the installed performance tracking system
- Submission dates for *Quarterly Reports*
- First quarterly meeting
- Submission of *Final Report*
- Wrap-up meeting



Attachment B: Measure Selection Guidelines

Performance tracking may not be applicable to all implemented RCx measures. The following guidelines are provided to assist PT Providers in selecting measures. The PT Provider should consult the owner when selecting measures, e.g., to determine if there are any planned changes expected in the building that may affect measure performance during the tracking period.

The following characteristics apply to measures that are good candidates for performance tracking:

1. The measure can be easily trended by the BAS, with minimal additions of monitored points and sensors.
2. A variation in measure performance and operation can be easily verified by analyzing trended data.
3. There will be minimal changes / retrofits to the system in which the measure serves. For example, if a measure addresses Fan Variation for an AHU serving an office space, and the occupancy for the space is expected to vary substantially in the following year, performance tracking results for the measure may be inconclusive.
4. The measure has a high potential risk for not persisting, i.e., it has a low estimated effective useful life. E.g., equipment operating schedules that can easily be changed.
5. The measure's energy and demand savings are a significant portion of the RCx project's savings.
6. The owner is interested in tracking the measure.
7. The owner understands the measure and is able to address performance issues that may arise during the performance tracking period.

The specific points to track for each measure may vary from project to project. As a start, the points trended for evidence of implementation under the RCx project can be a guide for developing the points to track for the PT Project. The specific points to track for the PT Project should be clearly outlined in the *Performance Tracking Plan*.



Attachment C: Performance Quarterly Report Outline

1.0 Project Summary

This section provides a description of the RCx measures selected for performance tracking, including measure description, associated annual savings for each measure, and any additional information that may be related to the proposed monitoring of each measure.

2.0 Tracking Summary and Recommended Action

This section provides a brief summary of the findings for each measure and any recommended actions that should be taken to resolve outstanding issues.

3.0 Detailed Results by Measure

This section provides more detail on findings for each individual measure. The following information should be included for each tracked measure:

- Tracking performed: brief description of the measure and tracking method
- Tracking results: description of tracking results regarding measure performance and operation. Any relevant charts, correlations, or tables may be included in this section to add clarification to the results.
- Recommended follow-up or actions: address any issues or problems found during the quarterly tracking period, including recommended actions to be taken by the owner and facility staff.