Final Report

Process Evaluation of the 2006-2008 Southern California Edison Retrocommissioning Program

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PROCESS EVALUATION OF THE 2006-2008 SOUTHERN CALIFORNIA EDISON RETROCOMMISSIONING PROGRAM
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Southern California Edison’s Retrocommissioning (RCx) Program was launched in 2006 to provide incentives and services to optimize the operation of energy-using systems in existing nonresidential buildings. In 2007, Southern California Edison (SCE) contracted with ASW Engineering Management Consultants, Inc. (ASW) to conduct a baseline accuracy verification review of three projects representing three different building types. Problems noted during that review led to a high-level review of the savings estimates for ten additional projects. Collectively, these reviews are referred to as an engineering review. The engineering review occurred from June 2007 through the spring of 2008. In 2008, SCE contracted with Research Into Action, Inc. to conduct a process evaluation of the RCx Program for the 2006-2008 program period. Data for the process evaluation were collected from June through October 2008. During the course of the evaluation, it was expanded to include a review of definitions of RCx and a comparative review of other RCx programs.

Program staff expressed particular interest in obtaining from the engineering review identification of problems in RCx service providers’ engineering calculations. From the process evaluation, staff expressed interest in obtaining recommendations to address delays that occurred during program delivery. The following is an overview of the findings, conclusions, and recommendations from the engineering review and process evaluation.

FINDINGS

The RCx program is managed and delivered through PECI, a third-party, implementation contractor. The 2006-2008 program enrolled about 150 projects in approximately 70 office buildings, hotels, grocery stores, shopping malls, and other commercial and light industrial facilities in southern California. The program is reportedly approaching its amended energy savings goal of 24,000 MWh, with savings expected to be between 17,000 and 26,000 MWh. However, it will fall short of its amended demand reduction goal of 4.47 MW. Program demand reduction is expected to be between 1.1 and 1.9 MWh.

Engineering Review

The reviewers made their own savings calculations for the baseline accuracy verification review of projects in three different building types. Savings estimated by the reviewers for one of these three projects exceeded the savings estimated by the service provider. Even so, the reviewers’ calculated savings for the three projects combined were only 68% of the savings estimated by the service providers for those three projects. The reviewers identified problems, including: the use of an obsolete baseline; a questionable calculation methodology; instances of savings estimates too great to be credible; and the inclusion of retrofit measures.
Based on a high-level review of service-provider documentation submitted for 67 RCx measures in 10 additional projects, the reviewers accepted the service providers’ savings estimates as submitted for only 25 of those measures. Most or all of the providers’ estimated savings may be achievable by those projects, but the providers’ documentation did not support their estimates. Documentation deficiencies included missing information (such as the calculations themselves) or missing data on which the calculations were based (such as facility descriptions, occupancy and energy-consumption assumptions, measurements, and equipment descriptions and usage). Other problems with providers’ calculations included invalid assumptions, questionable calculation methodologies, the use of inappropriate weather data, and savings estimates so great they are not credible.

**Process Evaluation**

**Program Administration**

Overall, the program’s administrative process worked well. Communication between the parties involved in the program and its projects was frequent and responsive. Program forms and templates are generally clear and effective. Program marketing to customers is among RCx service providers’ responsibilities. However, these market actors have limited awareness of their marketing role and brought few participants to the program. Partly for this reason, marketing took more time than expected to enroll participants, but a protracted customer enrollment process is typical for new energy efficiency programs. In the end, the program successfully created the basic infrastructure of tracking, reporting, and communication tools and procedures necessary to carry the program forward.

**Program Delivery**

The training and experience of the program-approved service providers, both active and inactive, suggest they are qualified to do the RCx work expected of them by the program. Furthermore, the initial number of approved providers was adequate to do program projects. However, as service providers gained experience with the program, the number of them available to do program work declined.

Although the first step of program implementation – building screening – did not experience delays, it was the source of some delays. Some buildings accepted to the program had building automation systems that were unable to provide trend data, requiring additional time and expense to upgrade the systems or to install data loggers. Other buildings admitted to the program had such minimal energy-saving opportunities they were dropped from the program following the service provider’s investigation.

SCE’s *Owner Program Agreement* (OPA) includes two clauses that increase building owners’ perception of risk from program participation. Those provisions are the Building Investigation Fee Reimbursement provision and the Payment Disqualification clause. Both provisions have
delayed customers’ signatures and have even dissuaded customers from participating in the program.

The analysis and calculations underpinning service providers’ Master Lists of Findings often did not meet the expectations of program staff, resulting in multiple, time-consuming reviews by multiple parties. In response, some service providers omitted or deleted complex measures from their Master Lists of Findings, diminishing the reach and effectiveness of the program.

In the eyes of the service providers, the amount of work required of them by the program’s quality control reviews exceeded the compensation paid to them by the program. This was the cause of the decline in the number of service providers willing to do program work.

Customer Experiences

Overall, participant satisfaction with the program was mixed, but more participants reported satisfaction than reported dissatisfaction. In particular, the participants were satisfied with their PECI staff contacts and with their RCx service providers. The RCx program is meeting a customer need and interest. Participants’ interest in RCx is evident from their generally good understanding of it.

Even so, program satisfaction would have been even greater had it not been for project delays and other difficulties experienced by most participants. Some concerns expressed by key staff and service providers were felt by customers. Such concerns included: building automation systems that were unable to trend data; a lower priority given by service providers to customers’ program work than to work from private clients; and extensive and extended reviews of service providers’ work.

Program training of participants’ building staff did not extend beyond information about the building changes made through the program.

Finally, building owners do not necessarily perceive clear boundaries between RCx, retrofit, and offerings of other programs, and can be confused by having to understand and participate in multiple programs.

Definition of RCx

The descriptions of RCx offered by various relevant authorities are uniform and consistent with the program’s description of its RCx activities. However, the program differs from the reviewed definitions in its emphasis on energy savings and in its explicit requirement for energy-savings estimates. These estimates require a level of work from service providers that, in their view, is not adequately compensated by the program. This has had the effect of limiting both the process and scope of RCx activities that occurred through the program. The perceived imbalance between the program’s fees for the work expected by the program and the fees service providers...
expect to receive for such work are also at the heart of the program’s issues regarding energy savings calculations.

**RCx Program Comparison**

There are few stand-alone RCx programs outside of California. In comparison with the reviewed programs, SCE’s building-investigation fees are relatively low. The measures required to be implemented under the SCE program are relatively greater, while the program’s implementation incentives are relatively low. Generally, the SCE program’s other requirements are neither more nor less onerous than those of the reviewed programs. The SCE RCx Program stands out in project recruitment compared with the reviewed programs, both in regard to numbers of projects undertaken and completed, and in regard to the length of time required to enroll those projects.

**Program Goals**

The program’s theory and logic-model document lists eight program goals. Progress toward four of those eight goals was measured by this evaluation. Those four goals and the findings regarding them are as follows:

- **Goal:** Increase the number of commissioned buildings in SCE territory, thus increasing energy savings.

  **Finding:** The program accomplished this goal, if program participation equals building commissioning. However, the expectations about commissioning held by service providers and building owners were not universally met by program activities.

- **Goal:** Increase the pool of RCx service providers to accommodate more participants.

  **Finding:** The program experience decreased the pool of service providers willing to offer services through the program.

- **Goal:** Document processes and train staff on the optimized, building-system operations.

  **Finding:** Program changes to buildings were documented and building staff were “trained” on those changes, but the training was minimal and narrowly focused on those changes.

- **Goal:** Demonstrate a well-delivered RCx process so building owners and operators realize the value inherent in this service.

  **Finding:** Program activities did not always meet owners’ expectations for RCx and in that way may have reinforced one of the program’s market barriers, namely, “inconsistent approaches to building system optimization and RCx do not give a sense of the service and value that owners receive.”
CONCLUSIONS AND RECOMMENDATIONS

Two themes underlie program’s issues: 1) the program’s quality control process; and 2) service provider and customer expectations about the RCx process and activities.

Regarding the quality control process, the engineering review found the process did not adequately train or monitor the service providers. The resulting additional program attention on quality control became burdensome for both providers and customers, and was a principal source of program delays.

Regarding service provider and customer understanding of RCx processes and services, the program fell short of expectations for the depth of building investigations and the extent of measures addressed. And related to the earlier issue of quality control, as well as to the issue of expectations, the extent of the work required to document energy savings estimates was unexpected.

Other program issues included: project delays arising from shortcomings in the building screening process; project delays arising from customers’ perception of risk from signing the program’s OPA; customer confusion arising from multiple program offerings; and minimal building-staff training.

Service-Provider Investigations and Documentation

RCx service providers are not providing consistent, adequate, explanatory data to support their energy savings calculations. Factors contributing to this situation include: inadequate fees for service provider work; differing understandings of RCx; and insufficient understanding by the providers of the details and specificity expected in their Master Lists of Findings and required supporting documentation. Most providers performed their RCx evaluations from a component perspective, rather than taking a whole-system view. For their energy-savings calculations, service providers often defaulted to the use of bin-distribution analysis. Finally, while training about program processes was provided to service providers, training in standardized calculation methodologies for computing energy savings has not been provided.

Service provider fees and an approach to the definition of RCx are addressed in other sections. The following recommendations address the methodologies and contents of service provider reports.

Recommendations

→ Recommendation: Standardize service providers’ energy savings calculation methodologies and require providers to attend a workshop on preferred savings estimate methodologies. Set uniform and consistent provider expectations and provide a forum for discussion and the answering of questions.
**Recommendation:** To assure adequacy and availability of project documentation, the data for every RCx project should include the following:

- Facility name, address, and SCE’s project identification number
- Relevant energy-use history
- Description of the facility, (including photographs and drawings of exterior exposures and facility layout), its major activities, operating hours, general description of all major electric end-use systems and components in the facility, and sizes of conditioned and non-conditioned spaces
- Design parameters of all HVAC equipment, even if the recommended RCx measures include only a few of the system’s components; include photographs of major equipment and equipment nameplates
- Piping diagrams and baseline empirical data (kW, flow, temperatures, etc.) for equipment affected by the recommended measures
- Workbooks, including an introductory spreadsheet that describes the objectives, the general layout of each of its worksheets, the major equations used, and the location of the baseline and alternative annual electric consumption data

**Recommendation:** To assure appropriate, consistent analysis of building systems and equipment, service providers should also observe the following procedures:

- For the “common measures” listed in the program guidelines, use the measures’ corresponding deemed energy savings
- When modeling physical systems, specify the kWh per year for the baseline condition before modeling an alternative RCx measure
- Analyze at the whole-system level, not merely on a component-by-component basis
- Recognize the bin-distribution approach is not always the best method to calculate energy savings; the primary sensible load for some interior spaces can take place at any time of the year, regardless of outside temperature, and for such spaces, the analysis must include sensible heat load, rather than merely consideration of bin-distribution data
- For weather-dependent measures, the energy savings should be normalized to long-term, average, weather data

**Recommendation:** To correlate the level of service provider work with project impact, adopt a three-tiered protocol for investigation rigor, based on site or project size as follows:
Sites with anticipated energy savings of 200,000 kWh or less: For measures other than “common measures,” use program work papers, engineering references, manufacturing catalog data, and on-site survey data to estimate energy savings.

Sites with anticipated energy savings between 200,000 kWh and 800,000 kWh: Provide metered data for pre- and post-conditions for the three measures with the greatest energy savings. All pre- and post-conditions must be supported by full documentation, including calculations, capture-picture of trended data, etc.

Sites with anticipated energy savings of 800,000 or more: Provide metered data for pre- and post-conditions for the three measures with the greatest energy savings, and for every other measure with a minimum of 100,000 kWh energy savings. All pre- and post-conditions must be supported by full documentation, including calculations, capture-picture of trended data, etc.

Service Provider Fees

The decline in the number of service providers available to do program work occurred because the providers’ private clients will pay them more than the program is paying for work requiring comparable time and effort. This results in some providers forthrightly declining to do program work and in others being “too busy” to do program work. Both active and inactive RCx service providers are being dissuaded from participating in the program by the level of program fees.

When service providers scaled their building-investigation work to a level they viewed as appropriate for the fees they receive from the program, that work was often challenged as inadequate to support the depth of analysis required to demonstrate energy savings for more complex measures. This resulted in additional work, additional time-consuming reviews of that work, and in the removal of some previously recommended measures from their Master Lists of Findings.

Recommendation

**Recommendation:** To maintain and increase the pool of experienced RCx service providers and to increase program energy savings, the program will need to increase the building-investigation fee to a level viewed by service providers as more adequate. To be most effective, this should be done in conjunction with standardization of energy savings calculation methodologies and the adoption of explicit protocols for service provider rigor. Also, consider asking participants to pay a portion of the investigation fee.

Building Screening

The building screening process does not always review the capability of building automation systems to provide trend data and the process does not filter out buildings with little or no
opportunity to obtain energy savings from RCx measures. The latter circumstance results in fruitless service provider work and disappointed customers.

**Recommendation**

- **Recommendation:** To facilitate a more efficient building investigation process, and to avoid fruitless service provider work and disappointed customers, apply more rigorous building-screening and service provider selection standards, including:
  - Screening for the ability to provide trend data
  - Communicating to building owners and facility staff the need for and importance of obtaining trend data
  - Screening for buildings with electric savings potential
  - Matching buildings without trend-data capability to service providers who have experience with such buildings

**Owner Program Agreement**

SCE’s Owner Program Agreement (OPA) includes two clauses that owners view as creating uncertainty regarding their financial obligations under the agreement, thereby increasing their perception of risk from program participation. One of the provisions (*Owner Responsibilities*, paragraph 2) requires building owners to implement all of the measures identified in the *Master List of Findings* that have a payback of one year or less. Building owners who do not implement all such measures are obligated to reimburse a portion of the building investigation fee to SCE. Expenses for measure installation can be tens-of-thousands to hundreds-of-thousands of dollars, while service providers’ fees for building investigations and preparation of the *Master List of Findings* can be $75,000. Thus, this provision is perceived by some owners as creating substantial financial uncertainty.

The other provision of which owners are wary (*Payment Disqualification*) requires partial reimbursement of incentives if changes the owner makes within five years of program participation diminish the savings from incentivized measures.

The agreement also misses an opportunity to obtain additional marketing resources for the program.

**Recommendations**

- **Recommendation:** To minimize owners’ perception of risk from program participation, make a greater effort to communicate the purpose and intent of the OPA language to building owners during the owner screening process and to obtain their tentative acceptance of those requirements at that time.
Recommendation: To reduce owners’ perception of risk further, consider deleting the Payment Disqualification clause from the OPA.

Recommendation: To enhance program-marketing efforts, use the San Diego Gas & Electric (SDG&E) OPA as a model to include a provision in the SCE OPA granting permission to the utility to use limited customer information for publicity purposes.

Quality Control of Service-Provider Findings and Documentation

The engineering review revealed a need for ongoing review of the program’s quality control process.

Recommendations

Recommendation: To improve the program’s quality control process, redesign quality control as a two-level process. The first level of review is that done by program or implementation staff and should encompass the first three to five investigations done by each provider. With consistently satisfactory results for a given provider, further review of that provider’s work can occur on a random-sampling basis.

Recommendation: The second level of review is that done by a third-party contractor to validate the program reviews done by program or implementation staff. Three to five early program projects should be subjected to a baseline accuracy validation evaluation, with a further 10 early projects receiving a high-level documentation review.

Customer Experiences

The RCx program is meeting a customer need and interest. Participants’ interest in RCx is evident from their generally good understanding of it. Even so, splitting energy efficiency activities into multiple separate programs is confusing to them (and to the service providers) and is resulting in lost opportunities.

The program’s experience validates a premise of the program’s theory in demonstrating that the amount of time required to implement an RCx project is often underestimated. RCx has no natural implementation timeline. Issues often come up that extend the process, including availability of in-house labor, capital funding availability, and unforeseen problems encountered during implementation.

Recommendations

Recommendation: To diminish customer confusion and lost opportunities, integrate RCx and retrofit activities into the same process.
Recommendation: To avoid lost savings from unforeseen delays, allow flexibility in project due dates to allow owners the time they need to make decisions about measure implementation, to address unexpected circumstances, and to fit implementation activities into their budget cycles.

Building-Staff Training

The minimal and narrowly focused program training misses an opportunity to broaden facility staff knowledge of RCx practices and procedures, and may be limiting the persistence of savings from RCx projects. Training is given short shrift because service providers often spend more time than budgeted on the building investigation and reviews of their Master Lists of Findings, leaving uncompensated the time required to train building staff.

Recommendation

- Recommendation: To encourage more breadth and depth of staff training that will foster greater persistence of RCx savings, consider paying a separate, specific, provider fee for completing such building training. Also, establish a more explicit program tie to the Building Operator Certification (BOC) program and consider offering free or steeply discounted tuition to BOC classes for facility staff of participating buildings.