

Phase I Ex Ante Review Findings

Table 1-1: Project Information

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|---|---|
| | |
| IOU | Pacific Gas & Electric |
| Application ID | 2K13211880 |
| Application Date | 8/29/2013 |
| Program ID | PGE21011 |
| Program Name | CORE RCx – Commercial Calculated Incentives |
| Program Year | 2013 |
| Itron Project ID | X429 |
| IOU Ex Ante Savings Date | 1/13/2014 |
| CPUC Staff Measure Name | Retrocommissioning at Healthcare Facility |
| Project Description | Supply air temperature resets for four AHUs, airflow setback for one AHU, chilled water supply temperature reset, and heating hot water supply temperature reset |
| Date of CPUC Staff Review(s) | 12/24/2013 & 1/24/2014 |
| Primary Reviewer / Firm | Rachel Murray / DNV GL |
| Review Supervisor / Firm | Joseph Ball / Itron |
| CPUC Staff Project Manager | ██████████ / California Public Utilities Commission, Energy Division |
| CPUC Staff Policy Authorization (as needed) | TBD |
| Type of Review (Desk, On-site, Full M&V, Tool) | Desk Review |
| CPUC Staff Recommendation | <p>CPUC waives further review of this project, and recommends that PG&E apply a GRR of 0.9 to the trued-up savings after post-installation M&V is conducted.</p> <p>Staff recommends that PG&E take actions recommended in the <i>Summary of ED Requested Actions by the IOU</i> section.</p> |

Measure Description

The four retrocommissioning measures included in this application are as follows:

- M1. Recode the supply air temperature (SAT) setpoint logic for each of four air handling units (AHU), so that they reset based upon the outside air temperature. The reset would apply only once the dry-bulb outside air temperature (OAT) is below 60°F. Presently, the SATs hold steady at about 53°F. Upon recoding, whenever the OAT drops below 60°F, the SAT will begin to increase up to a maximum of 57°F (maximum is set for when the OAT drops to 50°F or below).
- M2. Recode the VFD controls for both supply fans in each of two AHUs to run at 50 percent speed all of the time.
- M3. For each of three chillers, reset the chilled water supply temperature (CHWST) based upon the dry-bulb OAT. The reset would apply only once the OAT is below 60°F. Presently, the CHWSTs hold steady at about 44°F. Upon modifying the controls, the CHWSTs will begin to increase from 44°F up to a maximum of 47°F (maximum is set for when the OAT drops to 55°F or below).
- M4. For each of four boilers, reset the heating hot water supply temperature (HHWST) based upon the dry-bulb OAT. The reset would apply only once the OAT is above 50°F. Presently, the HHWSTs hold steady at about 177°F. Upon modifying the controls, the HHWSTs will begin to decrease from 177°F down to a minimum of 150°F (when the OAT rises to 60°F or above).

Summary of Review

The Investor-Owned-Utility (IOU) submitted documents between the dates of 9/30/2013 and 1/13/2014 for this Phase I review. Those most closely reviewed are listed below:

- *34068 Energy Report 7-2012 to 6-2013.pdf*;
- *Measure Trending Plan.pdf*;
- *M1 CBOA Tool 2013 01 16 ##### V1 SAT RESET.xlsm* which was later superseded by *##### Adjusted M1 and M2 calcs.xlsx*;
- *M2 AHU1 Fan Speed Reduction Calcs.xlsx* which was later superseded by *##### Adjusted M1 and M2 calcs.xlsx*;
- *M3 CBOA Tool 2013 01 16 ##### V1 CHW-CW RESET.xlsm*;
- *M4 ##### HHW Calcs version 2.xlsx*; and
- *#####-Report Final Rev 2.docx* which was later superseded by *#####-Report Final Rev 3 with savings adjustments V1.docx*.

After augmenting the savings calculations for M1 and M2, as recommended by the primary reviewer on 12/24/2013 via CMPA, the CPUC review staff found the superseding savings

calculations using the modified output of CBOA, to be reasonable.¹ The savings calculations for M3, using CBOA, were found to be reasonable. The savings for M4 were determined by using a customized spreadsheet that was informed by 20 days of pre-implementation logger trend data; these were found to be based on sound assumptions and calculations. A summary of the history of the savings per measure is provided in Table 1-2.

Table 1-2: Energy Savings Calculations by Measure

| Measure | Annual Savings | | Peak Demand | Review Comments (<i>Source</i>) |
|------------------|-----------------------------|--------------------------------|-------------|--|
| | Electrical Energy, kWh/year | Natural Gas Energy, therm/year | Savings, kW | |
| M1 | 397,820 | 19,123 | 0 | Error in CBOA over-estimated savings. (<i>M1 CBOA Tool 2013 01 16 ##### V1 SAT RESET.xlsm</i>) |
| | 180,967 | 19,123 | 0 | PECI's recommended work-around yielded credible savings. (<i>##### Adjusted M1 and M2 calcs.xlsx</i> delivered 2014-01-13) |
| M2 | 328,681 | 177 | 33 | Over-estimated savings for M1 were used as inputs for M2 savings, thus M2 savings were also overestimated. (<i>M2 AHU1 Fan Speed Reduction Calcs.xlsx</i>) |
| | 285,080 | 244 | 16 | PECI's recommended work-around for M1 CBOA calculations changed savings attributable to M2. (<i>##### Adjusted M1 and M2 calcs.xlsx</i> delivered 2014-01-13) |
| M3 | 30,888 | 0 | 0 | None. (<i>M3 CBOA Tool 2013 01 16 ##### V1 CHW-CW RESET.xlsm</i>) |
| M4 | 0 | 20,829 | 0 | None. (<i>M4 ##### HHW Calcs version 2.xlsx</i>) |
| Total | 757,389 | 40,129 | 33 | Total prior to ED's discovery of CBOA error in M1 calculations that also impacted M2 savings. |
| | 496,935 | 40,195 | 16 | Total subsequent to implementing Peci's work-around to correct M1 and M2 savings. |
| Total Difference | (260,464) | 66 | (17) | |

¹ Based upon discovering an error in the CBOA savings calculations during the EAR process, the IOU and the retro-commissioning agent have reached out to an engineer at Peci, the developer of BOA/CBOA. According to Peci, the error occurs when the model makes use of user-input mixed air temperatures for measures that involve implementing a supply air temperature setpoint based upon OATs. While Peci was able to provide a reasonable work-around for purposes of this application, the Peci engineer has forwarded this incident to the development team. It is not known when an update to BOA/CBOA will be available that includes a resolution to this software bug.

Review Conclusion

The proposed PG&E initial savings estimates are 496,935 kWh and 40,195 therms savings. CPUC staff waives further review of this project, and recommends that PG&E apply a GRR of 0.9 to the true-up savings after post-installation M&V is conducted. Staff recommends that PG&E implement recommendations described in the next subsection, including the refinement of M&V plan for this and similar project moving forward.

Summary of CPUC Staff Requested Action by the IOU

- Set the EUL of each of the four RCx measures to 5 years.
- Continue to engage the support of PECI to eliminate the source of the overestimated savings when using the BOA tool to calculate savings due to resetting supply air temperatures, as observed for M1. Until the BOA tool is corrected, implement the work-around identified by PECI for all other projects in which savings for the supply air reset measure are calculated using the BOA tool and inform staff when the bug in the BOA tool is fixed.
- CPUC Staff requests that the IOU undertake appropriate M&V as dictated by the CORE RCx program whereby the minimum M&V requirements depend upon the amount of savings per measure as shown in Table 1-3.

Table 1-3: Savings Analysis and M&V Requirements of RCx Program

| Measure Size | Initial Savings Calculation by Provider | Source of Initial Savings Submitted | Source of Final Savings Claimed | M&V Required |
|--|--|---|---|--|
| Small (BOA Tool Applies) | Savings < 75,000 kWh/yr or Savings < 5,000 th/yr | BOA Tool Results | BOA Tool Results | Pre- and Post-Implementation Snapshots |
| Small (BOA Tool Does Not Apply) | Savings < 75,000 kWh/yr or Savings < 7,500 th/yr | Initial Savings Calculation by Provider | Initial Savings Calculation by Provider verified by snapshots | Pre- and Post-Implementation Snapshots |
| Medium | 75,000 kWh/yr < Savings < 200,000 kWh/yr or 7,500 th/yr < Savings < 20,000 th/yr | Initial Savings Calculation by Provider | Initial Savings Calculation, Adjusted for Pre- and Post-Implementation Trends | Pre- and Post-Implementation Trend Logging |
| Large | 200,000 kWh/yr < Savings or 20,000 th/yr < Savings | Initial Savings Calculation by Provider | Calculations Based on Pre- & Post-Implementation Measurements | Pre- and Post-Implementation Trend Logging |

- To comply with the program requirements set forth in Table 1-3, CPUC staff recommends that the IOU follow the directions provided in the right-most column of Table 1-4.

Table 1-4: EAR Recommendations Regarding RCx Measures

| Measure | Size | EAR Ex Ante Savings Analysis and M&V Recommendation, if any |
|---------|-----------------------------|---|
| M1 | Small (BOA Tool Applies) | Pre- and post-implementation EMS snapshots |
| M2 | Medium | 2 weeks of pre- and post-implementation trend logging to customize C-BOA |
| M3 | Small (BOA Tool Applies) | Pre- and post-implementation EMS snapshots |
| M4 | Large | 20 days of pre- and post-implementation trend logging to update savings in customized spreadsheet |

- For M1, relax the M&V plan to include pre- and post-implementation snapshots of EMS displays. The pre-implementation EMS snapshots should be added to the documentation files.
- For M2, pre- and post-implementation trend logging is recommended for a minimum of one week. The pre-implementation trend logging should be added to the documentation files.
- For M3, the pre-implementation snapshots of EMS displays should be added to the documentation files and post-implementation EMS snapshots are recommended.
- For M4, post-implementation trend logging is recommended for 20 days (the same duration as was performed pre-implementation).

Table 1-5 Review Findings

| Reviewed Parameter | Analysis |
|--|--|
| Project Baseline Type (Early Replacement, Normal Replacement, Capacity Expansion, New Construction, System Optimization, Add-on Measures, Major Renovation) Note: For early retirement projects only, include RUL through EUL baseline) | IOU Proposal: System Optimization |
| | CPUC Staff Assessment: System optimization is appropriate. In situ conditions form the appropriate baseline for RCx projects. |
| | CPUC Staff Recommendation: No recommendations at this time |
| Project Baseline Technology (in situ equipment, Title 24 (specify year), other code or other efficiency level (specify), industry standard practice - ISP) | IOU Proposal: In situ equipment |
| | CPUC Staff Assessment: In situ equipment is appropriate |
| | CPUC Staff Recommendation: No recommendation at this time |
| Project Cost Basis (Full Incremental, or Both. Note: For early retirement projects, include RUL through EUL cost basis treatment) | IOU Proposal: Full cost |
| | CPUC Staff Assessment: Full cost is the appropriate basis for RCx projects |
| | CPUC Staff Recommendation: No recommendations at this time |
| RUL (required for early retirement projects only, otherwise N/A) | IOU Proposal: N/A |
| | CPUC Staff Assessment: N/A |
| | CPUC Staff Recommendation: N/A |
| EUL (for each measure) | IOU Proposal: EULs are not discussed in the <i>RCx Investigation Final Report</i> |
| | CPUC Staff Assessment: EULs for each of the proposed measures should be identified in the <i>RCx Investigation Final Report</i> . |
| | CPUC Staff Recommendation: Per Appendix B in the <i>RCx Project Submittal Guidelines</i> , the EUL of each of the proposed measures is five (5) years. |

| Reviewed Parameter | Analysis |
|---|---|
| Savings Assumptions | IOU Proposal: For M1, raising the supply air temperature delivered by four AHUs when OAT is below 60°F will reduce the central plant cooling load and, to a lesser extent, the boiler load. For M2, reducing the fan speed by percent for two AHUs will reduce energy usage. For M3, raising the chilled water supply temperature at three chillers when the OAT is below 60°F will also reduce chiller load. For M4, lowering the heating hot water supply temperature on four boilers when the OAT is above 50°F will reduce boiler load. |
| | CPUC Staff Assessment: Accept |
| | CPUC Staff Recommendation: None |
| Calculation Methods/Tool review | IOU Proposal: C-BOA was used to determine the savings for M1, M2, and M3. A customized spreadsheet was used to determine the savings for M4. The C-BOA files for M1 and M2 were revised to compensate for an overestimation of the savings. |
| | CPUC Staff Assessment: Appropriate tools were used to determine the savings. |
| | CPUC Staff Recommendation: Engage the support of PECEI to eliminate the source of the overestimated savings when using the BOA tool to calculate savings due to resetting supply air temperatures. |
| Pre- or Post-Installation M&V Plan | IOU Proposal: For M1, M2, and M4, the RCx implementer proposed pre- and post-implementation trend logging of essential data, but data were not provided for M1 and M2. For M4, trend logging of two hot water pumps occurred over a span of 20 days. For M3, pre- and post-implementation snapshots were proposed. |
| | CPUC Staff Assessment: The proposed M&V plan is consistent with program requirements for the savings claimed as of 12/17/2013. |
| | CPUC Staff Recommendation: For M1, the M&V plan can be relaxed to pre- and post-implementation snapshots of EMS displays—these snapshots should be included in the documentation files. For M2, pre- and post-implementation trend logging is recommended for a minimum of one week. For M3, the pre- and post-implementation snapshots of EMS displays should be included in the documentation files. For M4, post-implementation trend logging is recommended for 20 days. |
| Net-to-Gross Review | IOU Proposal: Net-to-gross issues were not discussed in the documentation. |
| | CPUC Staff Assessment: Not assessed |
| | CPUC Staff Recommendation: None |

Table 1-6 Energy Savings Summary, Project Costs & Incentive

| Description | IOU Ex Ante Claim | CPUC Staff Recommendations |
|---|--------------------------|-----------------------------------|
| First Year kWh Savings | 496,935 | 496,935 |
| First Year Peak kW Savings | 16 | 16 |
| First Year Therms Savings | 40,195 | 40,195 |
| kWh Savings (RUL Period) | N/A | N/A |
| Peak kW Savings (RUL Period) | N/A | N/A |
| Therms Impact (RUL Period) | N/A | N/A |
| kWh Savings (RUL thru EUL Period) | 496,935 | 496,935 |
| Peak kW Savings (RUL thru EUL Period) | 16 | 16 |
| Therms Savings (RUL thru EUL Period) | 40,195 | 40,195 |
| Annual Non-IOU Fuel Impact (RUL Period) | N/A | N/A |
| Annual Non-IOU Fuel Impact (RUL thru EUL Period) | N/A | N/A |
| Project Costs for Baseline #1 (RUL or EUL) | \$ 29,440 | \$ 29,440 |
| Project Costs for Baseline #2 (EUL minus RUL period) | N/A | N/A |
| Project Incentive Amount | \$ 13,660 | \$ 13,660 |