

# Final Ex Ante Review Findings

**Table 1-1: Project Information**

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| <b>IOU</b>  | Pacific Gas and Electric (PG&E)  |
| <b>Application ID</b>                                     | 2K1221049C   |
| <b>Application Date</b>                                   | 2/11/2013  |
| <b>Program ID</b>   | PGE21262   |
| <b>Program Name</b>                                       | UC/CSU Partnership Program (3P)  |
| <b>Program Year</b>                                       | 2013   |
| <b>CPUC Project ID</b>                                    | X219   |
| <b>IOU Ex Ante Savings Date</b>                           | 3/14/2014  |
| <b>CPUC Staff Measure Name</b>                            | Custom lighting retrofit   |
| <b>Project Description</b>                                | This university campus project called “Smart Lighting initiative II - Area 1” includes the lamp and ballast retrofit or wholesale replacement of most fixtures in selected classroom, office, and laboratory buildings.  |
| <b>Date of CPUC Staff Review</b>                          | 12/31/2014   |
| <b>Primary Reviewer / Firm</b>                            | Charles Ehrlich  |
| <b>Review Supervisor / Firm</b>                           | Joseph Ball / Itron, Inc.  |
| <b>CPUC Staff Project Manager</b>                         | ██████████   ██████████ ██████████ ██████████<br>██  |
| <b>CPUC Staff Policy Authorization (as needed)</b>        |  |
| <b>Type of Review (Desk, On-site, Full M&amp;V, Tool)</b> | Desk Review  |
| <b>CPUC Staff Recommendation</b>                          | The revised ex ante savings are approved at 692,956.8 kWh, 141.80 kW, and –4,820.5 Therms (including peak coincident demand and HVAC interactive effects). Provide the proposed final financial incentive amounts and calculations along with a description of |

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|  | the final data collection sample (location and quantity of data loggers), data logger files and analyses, and final savings estimates. The PA must demonstrate that the electrical energy savings claim for this project and the other lighting projects referenced in this document (application numbers 2K1317266C, 2K1317267C, and 2K1317268C) are eligible for PA ratepayer funding. Provide 36 months of 15 minute interval (kW) billing data for the IOU meter serving the customer’s central electrical distribution grid. Provide the tariff schedule for this electrical service. |
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### Measure Description

This project includes lighting improvements in five mixed-use office/laboratory buildings at a university campus. Three of the buildings include some classrooms and lecture spaces. Nearly all of the project fixtures will be retrofitted with upgraded fluorescent technology or modified to accept LED sources; less than 5% of the fixtures will be entirely replaced (not retrofitted) with new high efficiency light sources. The savings calculator initially used a mixture of “early retirement” measures with dual baseline savings calculations and “replace on burnout” (ROB) measures using new construction or industry standard practice baseline efficiency assumptions. The application estimates project savings to be 618,733 kWh and 263.3 kW for electricity and zero Therms of natural gas, excluding interactive effects. Including peak demand and HVAC interactive effect factors the project savings estimates are 692,956.82 kWh and 323 kW for electricity, and -4,820 Therms of natural gas. The project incentive is \$148,496.01 which is less than 50 percent of the \$744,441.77 incremental measure cost for the project.

### Summary of Review

Pacific Gas and Electric (PG&E), also referred to as Program Administrator (PA), previously submitted the following documents to CMPA for this review:

- Lighting Application package with PA review comments (.xlsx);
- Energy Division checklist and show stopper list (.xlsx).
- Campus electrical use documentation (.xlsx);
- Revised measure-by-measure and building-by-building savings calculator (.xlsx);
- Project and incremental measure cost calculations (.xlsx);

- Monitoring plan (.docx); and
- Campus baseline study documentation (.pdf and .docx);

PG&E recently submitted additional documents including a revised lighting calculator showing savings for 42 different buildings and project areas. This review applies only to the original scope of the project involving five buildings. This review incorporates comments submitted by memo as a follow-up to a conference call with the PA.

The CPUC reviewer accompanied PA program staff to inspect the pre-existing conditions on September 5, 2013. In response to prior CPUC reviewer feedback in November, CFL-like retrofits, other deemed measures, and occupancy sensor were removed from this application as directed by CPUC staff and some of these measures apparently will be processed through the PG&E Deemed program instead.

The CPUC staff reviewed the checklist, monitoring plan, project and incremental cost documents, the savings calculator data inputs, defaults, and functions, the project application, and reviewed the baseline study sample design and logger data analysis files. Staff finds that nearly every issue identified in the conditional approval memo dated November 15, 2013 has been addressed appropriately, with one significant exception. Other issues were identified, as discussed below, for future implementation efforts.

In the previous review, CCPUC staff identified a logic error in the way the savings calculator assigned the peak coincident demand factor to measures identified as having evidence that the fixture is in operation during the peak demand period. The formula utilized a DEER peak coincident demand factor of 0.44 to any measure identified as **not operating** during the peak demand period and a factor of 1.0 to everything else. All measures in all five buildings were marked as in operation and were assigned a factor of 1.0. Instead, the calculation must apply the appropriate DEER coincident peak demand factor (0.439 for DEER code CFLExEUnCZ12) to any measure identified as operating during the peak demand period, otherwise zero unless data logging is used to document the actual reductions for the project. This resulted in an over-estimation of peak coincident demand impacts of 56.1 percent.

During a conference call with the 3P implementer the following resolution to issues were discussed:

Revise the lighting operating hours using the appropriate DEER operating hours for each activity area.

- Revise the savings and project costs to include only eligible custom measures (remove ineligible deemed measures screw-in CFLs, etc.).

- Correct the application of the Peak Coincident Demand Factors and the HVAC Interactive Effect Factors in the lighting analysis calculations.
- Revise the savings calculation spreadsheet to use supported fixture wattage values from the most recent Standard Fixture Wattage table, DEER lighting disposition, or DEER default code, and to indicate the Fixture Code that was selected.
- Change the project baseline type from Early Replacement to Normal Replacement.
- Use ED's approved Lighting Controls Disposition on Lighting Use Reduction Factors for Occupancy Sensor savings.

This project's implementation was scheduled to begin Sunday November 17, due to the timing of the five-building implementation and the university's holiday schedule. Additionally, PG&E had sufficiently satisfied CPUC staff's cogen-PPP surcharge question for this phase of the project. CPUC staff conditionally approved this project provided that PG&E modified the energy savings as discussed.

CPUC staff reviewed the documentation for this project received on October 28, 2014 from PG&E. Staff was expecting final savings calculations for a group of five buildings that underwent a lighting fixture and controls retrofit under Project #: 2K1221049C. Instead staff received a scope of work document encompassing the original five buildings and adding a lighting controls project involving 38 new buildings. Three new application numbers (2K1317266C, 2K1317267C, and 2K1317268C) are cited in the scope of work, but those application forms were not provided with the submittal. The five original buildings in the new savings calculator are now claiming annual savings of 811,554 kWh, or 14 percent more than that conditionally approved. It is not clear what caused this increase in savings.

Staff recommends that the new controls projects (2K1317266C, 2K1317267C, and 2K1317268C) be removed from the scope of this review because it is not feasible to validate the savings for these 38 buildings at this time. Staff also recommends that we go with the ex ante savings estimates for the original project 2K1221049C at the conditionally approved amounts of 692,956.8 kWh, 141.80 kW, and -4,820.5 Therms (due to HVAC interactive effects).

Leading up to the current review, CPUC staff worked with the PA to change the savings calculator to appropriately account for the peak coincident demand factor as found in version 1.1 of the spreadsheet. Unfortunately, the current version 1.4 of the lighting calculator has been changed to again allow a 1.0 peak coincident demand factor. CPUC staff notes that the 1.0 value is applicable only to projects which involve pre- and post-installation M&V covering all measures of the representative space types and building types within the project. Sampling for on-site data collection must not be based on "cherry picking" of specific measures, space types, or building types that are known to exhibit hours of use or other savings parameters greater than

the DEER defaults. When some of the measures, space types, or building types are not subject to data logging then all measures, space types, and building types must use the DEER defaults. Data logging must be undertaken only when the additional incentive it is expected to document is sufficient to cover the cost of the data collection and related M&V efforts.

### **Review Conclusion**

The revised ex ante savings are approved at 692,956.8 kWh, 141.80 kW, and -4,820.5 Therms. The PA must perform the required action described below.

### **Summary of CPUC Staff Required Action by the IOU**

CPUC Staff requires that the IOU undertake the following steps and submit the following information upon completion of the project.

1. Provide the proposed final financial incentive amounts and calculations along with a description of the final data collection sample (location and quantity of data loggers), data logger files and analyses, and final savings estimates.
2. CPUC Staff have determined that this customer purchases a significant amount of electrical energy from the Western Area Power Administration (WAPA). The PA must demonstrate that the electrical energy savings claim for this project and the other lighting projects referenced in this document (application numbers 2K1317266C, 2K1317267C, and 2K1317268C) are eligible for PA ratepayer funding. Provide a description of the customer's electrical energy supply system including the sources of electrical power (e.g. WAPA, PG&E, Cogeneration, PV, etc.), the approximate percentage of power supplied from each source, and the approximate percent of time annually each electrical energy supply source provides service.
3. Provide 36 months of 15 minute interval (kW) billing data for the IOU meter serving the customer's central electrical distribution grid. Provide the tariff schedule for this electrical service.

### **For all future projects, CPUC Staff requires:**

Although not identified in the prior review for this project, CPUC staff found additional items of note to improve future implementation and evaluation efforts:

1. Staff did not review campus baseline study in detail but finds some issues with the sampling design which justified the use of the 1997 baseline study findings and takes issue with the hours of use estimation (logger extrapolation) method. These issues would need to be resolved if future projects at this campus are to be submitted with custom savings for controls.

2. Where M&V is proposed, the M&V plan must provide concise descriptions including measurement points, measurement period, measurement interval, measurement equipment, system diagrams, discussion of the accuracy measurement equipment and uncertainty associated with the results.

For this project, the updated M&V plan addresses some of these issues but does not include the measurement interval and does not justify the use of DEER for the baseline hours of use for spaces controlled by ALCS. CPUC Staff guidance is to conduct both pre- and post-installation monitoring when documenting peak demand reduction for controls savings. The proposed measurement period is 2 weeks. For most projects 2 weeks is inadequate for pre or post measurement as this does not capture enough variations in system operation associated daily differences in operation, e.g. weekdays versus weekends, breaks between school sessions, etc.

If it is too expensive to conduct thorough M&V then the default DEER values and methodologies must be used throughout the project. The IOU must set clear guidelines to third party implementers regarding how to determine when a building is not a DEER default and provide a savings cut-off where M&V is not cost-effective for non-DEER building types.

3. For dual baseline projects, provide the cost basis for the EUL-RUL period and ensure that the incentive is calculated based on the recent Commission decision for dual baseline projects. From CPUC Decision D.12-05-015 page 349:

“The measure or project cost utilized in an early-retirement case is the full cost incurred to install the new high-efficiency measure or project, reduced by the net present value of the full cost that would have been incurred to install the standard efficiency second baseline equipment at the end of the remaining-useful-life period. Thus, the early-retirement cost is higher than the incremental cost used in a replace-on-burnout or normal-replacement case, only by the time value of the dollar amount of the standard equipment full installed cost, using our adopted cost-effectiveness discount rate to calculate that time valuation. As with all measures, our policy expects that incentives offered for early retirement will not exceed the actual early retirement cost.”

For the Early Retirement portion of this project, the present value incremental measure cost was not determined. CPUC Staff do not require the program administrator to incorporate this correction for this project. However, all future Early Retirement Projects shall incorporate the requirement and use it as the proper basis for determining financial incentives and not full project costs.

4. CPUC staff request that the PA be diligent in documenting customer eligibility for Program participation and ensure that it is properly claiming savings impacts.

CPUC staff identified during review of the initial documentation submission **for this project** that the PA was claiming electrical energy savings for this customer when the customer does not purchase all of its electricity from the IOU and may generate some of its electricity from a cogeneration plant and or photo photovoltaic systems. CPUC staff were initially unable to verify impact claims due to concerns that the PA may improperly claim electrical energy savings for projects at this campus and at the facilities of other customers who participate in this program.

CPUC staff have recently issued a separate data request on this issue, requesting that the PA identify customers who might have similar issues. These issues may be associated with customers who do not purchase natural gas or electricity from the IOU, who purchase some portion of natural gas or electricity from the IOU and some natural gas or electricity from another party, or customers who own, operate, lease, purchase or use electricity, steam or hot water generated from cogeneration systems.

5. The savings calculator needs to default to “DEER” for all space types when the project building type matches an available DEER default building type.
6. When the project building type does not match any of the DEER building types, then site specific values can be used if thoroughly documented. This means that either all space types within each non-DEER building type must be sampled following the methods described in CPUC guidance or schedules for the lighting circuits are controlled automatically through an existing building energy management system (BMS). It is not acceptable to monitor only those spaces that are known to exhibit hours of use or other savings parameters greater than the DEER defaults while using the DEER default for other space types. All space types within that building must use a custom value determined either through data logging with acceptable samples or data collection and documentation of the lighting schedules controlled through the BMS.
7. Measures involving the addition of occupancy sensors must use the DEER default occupancy sensor savings factor and calculation methodology. If the DEER building type is not applicable, then the peak coincident demand reduction for lighting controls measures must be documented with both pre- and post-installation data logging following acceptable M&V sampling methods. It is not acceptable to monitor only those occupancy sensor measures, space types, or buildings that are known to exhibit greater reduction in hours of use than the DEER defaults while using the DEER default for other types of occupancy sensor measures, space types, or buildings. All occupancy sensor measure impacts within each representative space type for that building must be determined through pre- and post- data logging if the DEER defaults and methodology are not followed.

**Table 1-1: Review Findings**

| Reviewed Parameter  | Analysis  |
|---|---|
| <b>Project Baseline Type</b> (Early Replacement, Normal Replacement, Capacity Expansion, New Construction, System Optimization, Add-on Measures, Major Renovation)<br>Note: For early retirement projects only, include RUL through EUL baseline) | <b>IOU Proposal:</b> ER and ROB   |
|   | <b>ED Assessment:</b> ROB. The IOU corrected the project baseline type to Replace on Burnout in response to CPUC reviewer feedback.   |
|   | <b>ED Recommendation:</b> None  |
| <b>Project Baseline Technology</b> (in situ equipment, Title 24 (specify year), other code or other efficiency level (specify), industry standard practice - ISP)   | <b>IOU Proposal:</b> Second generation T8.  |
|   | <b>ED Assessment:</b> Generally second generation T8. Deemed measures and occupancy sensor savings removed from claim.  |
|   | <b>ED Recommendation:</b> None  |
| <b>Project Cost Basis</b> (for early retirement projects only, include RUL through EUL cost basis treatment)  | <b>IOU Proposal:</b> Full cost for custom measures only: \$1,522,247.12. The incremental cost is calculated at \$744,441.77.  |
|   | <b>ED Assessment:</b> The project’s incremental measure cost of \$744,441.77 justifies the maximum incentive of \$148,496.  |
|   | <b>ED recommendation:</b> none  |
| <b>RUL</b> (required for early retirement projects only, otherwise n/a)   | <b>IOU Proposal:</b> NA   |
|   | <b>ED Assessment:</b> NA  |
|   | <b>ED recommendation:</b> None  |
| <b>EUL</b> (for each measure)   | <b>IOU Proposal:</b> 15 years (ILTG-Lfluor-Elec)  |
|   | <b>ED Assessment:</b> 10.9 years (the average EUL for PG&E commercial lighting for the 2010-13 evaluation period). The EUL for each different measure is not reported in the savings calculator. The IOU’s 15-year claim is the maximum and applies to only some of the measures in this project. |
|   | <b>ED Recommendation:</b> Report the EUL for each measure and calculate the savings-weighted EUL for the project for CPUC reporting.  |
| <b>Savings Assumptions</b>  | <b>IOU Proposal:</b> Approved baseline is code/industry standard; when baseline exceeds code efficiency, baseline is existing case.   |
|   | <b>ED Assessment:</b> Correct   |
|   | <b>ED Recommendation:</b> None  |

*Final Ex Ante Review Findings*

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| <b>Calculation Methods/Tool review</b>        | <b>IOU Proposal:</b> PG&E's Lighting Template includes Interactive Effects and CDF calculations.   |
|   | <b>ED Assessment:</b> The CDF calculations were incorrect.   |
|   | <b>ED Recommendation:</b> Correct worksheet logic such that DEER CDF is applied only when there is evidence that the fixture operates during the peak demand period, otherwise the CDF is zero.  |
| <b>Pre- or Post-Installation M&amp;V Plan</b> | <b>IOU Proposal:</b> Customer will need to submit a post-installation M&V plan for savings beyond stipulated DEER values.  |
|   | <b>ED Assessment:</b> Savings are fixed at the approved amount.  |
|   | <b>ED Recommendation:</b> The campus baseline study has not been reviewed in detail but staff finds some issues with the sampling design and hours of use estimation method that would need to be addressed if any future projects are to be submitted with custom savings for controls. |
| <b>Net-to-Gross Review</b>                    | <b>IOU Proposal:</b> TBD   |
|   | <b>ED Assessment:</b> Net-to-gross interview not conducted   |
|   | <b>ED Recommendation:</b> None   |

**Table 1-2: Energy Savings Summary, Project Costs & Incentive**

| Description  | IOU Ex Ante Claim                            | CPUC Staff Recommendations |
|--|--|----------------------------|
| First Year kWh Savings                               | 618,733 excluding IE<br>692,957 including IE | 692,957                    |
| First Year Peak kW Savings                           | 263.29 excluding IE<br>323.01 including IE   | 141.80                     |
| First Year Therms Savings                            | 0 excluding IE<br>-4,821 including IE        | -4,821                     |
| kWh Savings (RUL Period)                             | NA   | 0                          |
| Peak kW Savings (RUL Period)                         | NA   | 0                          |
| Therms Impact (RUL Period)                           | NA   | 0                          |
| kWh Savings (EUL thru RUL Period)                    | NA   | 692,957                    |
| Peak kW Savings (EUL thru RUL Period)                | NA   | 141.80                     |
| Therms Savings (EUL thru RUL Period)                 | NA   | -4,821                     |
| Annual Non-IOU Fuel Impact (RUL Period)              | NA   | NA                         |
| Annual Non-IOU Fuel Impact (EUL thru RUL Period)     | NA   | NA                         |
| Project Costs for Baseline #1 (RUL or EUL)           | \$1,522,247.12                               | \$1,522,247.12             |
| Project Costs for Baseline #2 (EUL minus RUL period) | \$744,441.77                                 | \$744,441.77               |
| Project Incentive Amount                             | \$148,496                                    | \$148,496                  |