

Phase II Ex Ante Review Findings

Table 1-1: Project Information

IOU	PG&E
Application ID	7293
Application Date	4/23/2012
Program ID	CNC
Program Name	Customized New Construction Program
Program Year	2013
EAR Project ID	X488
IOU Ex Ante Savings Date	
Measure Name	Whole building
Project Description	New data center pods in existing building
Date of CPUC Staff Review	7/22/14; 9/5/14
Primary Reviewer / Firm	Doug Maddox/ J. J. Hirsch Associates
Review Supervisor / Firm	Nikhil Gandhi/ J. J. Hirsch Associates
CPUC Staff Project Manager	██████████ / California Public Utilities Commission, Energy Division
CPUC Staff Policy Authorization (as needed)	
Type of Review (Desk, On-site, Full M&V, Tool)	Desk
CPUC Staff Recommendation	The project is approved; however, ex ante savings, incremental measure costs and the proposed M&V plan are not approved. Staff recommends PG&E take actions as described in the summary of requested actions.

Measure Description

A whole building custom analysis was performed for POD II and POD III of a data center build-out. The following measures were considered in the analysis:

1. Water-side economizer serving computer room air handlers (CRAHs)
2. Air flow management to allow increased CRAH return air temperatures

Table 1-1: Key Savings Assumptions

Parameter	Baseline	Proposed	Notes
Water-side economizer	No	Yes	Fixed approach of 3°F was modeled.
Tower fan VFD	Yes	Yes	Oversized VFD has been proposed to meet future demand.
Condenser pump VFD	No	Yes	Oversized VFD has been proposed to meet future demand.
Chilled water pump VFD	No	Yes	Oversized VFD has been proposed to meet future demand.
CRAH fan VFD	No	Yes	
CRAH supply temperature	65°F	POD II: 77.4°F POD III: 74.7°F	This is critical to savings
CRAH return air temperature	78°F	POD II: 103°F POD III: 103°F	This is critical to savings

Summary of Review

In the Phase I review, the CPUC staff documented five issues, to which the Investor-Owned-Utility (IOU) has responded as listed below.

1. **CPUC:** In the Final Report it is stated that “Additional IT load may be added over the next two to four years”. Some of the HVAC systems for the facility are sized for the future expected load, which will be significantly greater than the current load. For example, the modeled cooling load for POD II is 448 tons, whereas the capacity of the cooling towers for the water-side economizer in that building is 1,600 tons. Where variable speed drives are used in these systems, this oversizing results in estimated savings that might not be realized when full expansion takes place.

IOU Response: The additional IT load that may be added in the future will be served by different cooling towers. The cooling towers were intentionally oversized to a large degree to maximize the water-side economizer operation. Sizes and loads will be checked during field verification.

CPUC Recommendation: Accept

2. **CPUC:** A safety factor of 1.2 is applied to the load when calculating both equipment capacities and energy consumption. While it is appropriate to use a safety factor for sizing, it is not appropriate for energy calculations.

IOU Response: We agree that it is not appropriate to use a 1.2 safety factor for energy calculations and will correct this during the post-field verification.

CPUC Recommendation: Accept

3. **CPUC:** Some information was submitted regarding energy consumption of the existing buildings, but it is not clear how the trend data were used to estimate the loads. The loads values in the workbook were hard values, not formulas, and thus it was not possible to determine how they were determined.

IOU Response: Load values in the workbook were based on trend data from the customer after the project began operation that show the UPS loads (see the files “Load Profile Report - SF09 POD2 CDB.PDF” for POD II and “Load Profile Report - SF09 POD3 CDB.pdf” for POD III from their EMS; note that each POD (or room) has two UPS feeds). The total maximum kW values recorded in the submitted trends were used as the design space load (kW) in our calculations.

CPUC Recommendation: Accept. Provide unlocked spreadsheets for final review.

4. **CPUC:** The analysis assumes constant approach of 3°F for the cooling towers serving the water-side economizer. While this scenario is possible, a more efficient control scenario would involve resetting the approach to a higher value as outdoor temperature drops. There is a trade-off between tower fan energy consumption and condenser pump power, which could be optimized by a reset control.

IOU Response: We developed our model to represent the customer’s sequences of operation that we observed in the design drawings and from other resources obtained from the customer. We understand that the customer will be optimizing their operating sequences. For the post inspection review we will obtain more detail on the sequence of operation and use this to amend the savings analysis as needed.

CPUC Recommendation: Accept

5. **CPUC:** Total incremental costs are listed in the calculation workbooks, but details regarding how the costs were calculated are limited. When costs are updated at the post-verification stage, additional detail should be provided showing how the incremental costs were calculated. Include breakdown of costs by component, where appropriate, including component sizes and quantities.

IOU Response: We will provide the cost breakdown of the systems associated with the energy efficiency measures during the post-verification phase and update the incremental measure costs as needed.

CPUC Recommendation: Some additional information is needed for this stage of the process. The IOU submittal dated 7/31/2014 included a more detailed cost estimate worksheet “*XXX_Pod 1 Cost IMC worksheet.xls*”. There is no mention of labor costs in the document; it is not clear whether labor cost is included in the listed values, or if they are additional. Moreover, the cost for hot aisle containment is described as an incremental cost, whereas there should be some form of containment in the baseline case, since the baseline document requires a hot aisle/ cold aisle configuration with ducted return for the power density of this project.

Review Conclusion

The project is approved. However, the ex-ante savings are contingent upon an updated analysis that is based on field verification results and includes the correction in which the sizing factor is not applied to the load for energy calculations (Item 2 in Review Summary).

Summary of CPUC Staff Requested Action by the IOU

CPUC Staff requests that the IOU undertake the following steps in the verification phase of the project:

1. Notify when post-installation inspection is planned. A staff consultant will accompany PG&E reviewer/s.
2. Data logging for verification should be extended to 28 days. Preferably this should include some hot/humid weather to test the limits of the water-side economizer system
3. Verify loads and equipment sizes.
4. Modify the calculation workbooks such that energy calculations are not subject to the sizing factors.
5. Update analysis based on observed sequences of operation.
6. Provide additional detail regarding incremental measure costs in the current stage of the project. This should include separation of labor and material costs, as well as an explanation of what is included in the measure cost for the hot aisle containment measure, and whether ducted return for the CRAH units was included in the baseline cost.
7. Provide more detailed breakdown of incremental measure costs at post-installation stage.
8. Submit measure EULs.

Table 1-2 Review Findings

Reviewed Parameter	Analysis
<p>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)</p>	IOU Proposal: New Construction
	CPUC Staff Assessment: Correct
	CPUC Staff Recommendation: Accept
<p>Project Baseline Technology (in situ equipment, Title 24 (specify year), other code or other efficiency level (specify), industry standard practice - ISP)</p>	IOU Proposal: “Energy Efficiency Baselines for Data Centers”, March 1, 2013
	CPUC Staff Assessment: Correct
	CPUC Staff Recommendation: Accept
<p>Project Cost Basis (Full Incremental, or Both. Note: For early retirement projects, include RUL through EUL cost basis treatment)</p>	IOU Proposal: Incremental
	CPUC Staff Assessment: Costs are provided without much granularity or explanation.
	CPUC Staff Recommendation: For current submission, separate costs into materials and labor categories. Also, clarify whether hot aisle containment is truly incremental cost; i.e. does the baseline need to account for the cost of ducted return. Appropriately calculated incremental measure costs should be provided at the time of the post-installation verification.
<p>RUL (required for early retirement projects only, otherwise N/A)</p>	IOU Proposal: N/A
	CPUC Staff Assessment: N/A
	CPUC Staff Recommendation: N/A
<p>EUL (for each measure)</p>	IOU Proposal: N/A
	CPUC Staff Assessment: Measure EULs are required to be assigned at this time to assess the measure eligibility. Since all measures appear to have longer than a five-year EUL, specific EUL assignments are not necessary at this time.
	CPUC Staff Recommendation: Submit measure EULs at the time of post-installation verification.

Phase II Ex Ante Review Findings

Reviewed Parameter	Analysis
Savings Assumptions	IOU Proposal: Listed in Table 1-2
	CPUC Staff Assessment: Basic assumptions are reasonable except the sizing factor and approach temperature listed in the Review Conclusion where a correction/explanation is needed.
	CPUC Staff Recommendation: For post-verification analysis, apply sizing factor to equipment size, but not to energy calculations; also update sizing and sequences of operation based on verification observations.
Calculation Methods/Tool review	IOU Proposal: Spreadsheet analysis
	CPUC Staff Assessment: Method is reasonable.
	CPUC Staff Recommendation: Accept
Pre- or Post-Installation M&V Plan	IOU Proposal: Perform visual inspections of relevant equipment components; collect 20 days of trend data for key parameters.
	CPUC Staff Assessment: Point selection is reasonable; data logging for 20 days may be insufficient.
	CPUC Staff Recommendation: Suggest extending data logging to 28 days. Notify staff of post-installation site-visit.
Net-to-Gross Review	IOU Proposal: None
	CPUC Staff Assessment: May be needed.
	CPUC Staff Recommendation: A NTG screening should be done.

Table 1-3 Energy Savings Summary, Project Costs & Incentive

Description	IOU Ex Ante Claim	CPUC Staff Recommendations
First Year kWh Savings	7,278,900	Update based on M&V
First Year Peak kW Savings	774	Update based on M&V
First Year Therms Savings	N/A	N/A
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)	N/A	N/A
Peak kW Savings (RUL thru EUL Period)	N/A	N/A
Therms Savings (RUL thru EUL Period)	N/A	N/A
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)	\$1,060,945	Update during M&V
Project Costs for Baseline #2 (EUL minus RUL period)	N/A	N/A
Project Incentive Amount	\$500,000	Update during M&V