

Ex Ante Review Findings

Table Error! No text of specified style in document.-1: Project Information

IOU	Pacific Gas and Electric Company
Application ID	NC0117606- X063
Application Date	3/10/2011
Program ID	Not provided
Program Name	New Construction and Savings by Design
Program Year	2011
Itron Project ID	TBD
IOU Ex Ante Savings Date	Not provided
ED Measure Name	Central chiller plant upgrades
Project Description	Installed three, 150 ton high efficiency VFD chillers in repurposed lab space
Date of ED Review(s)	3/16/2012
Primary Reviewer and Firm	Dale Tutaj/DNV KEMA
Review Supervisor and Firm	Joseph Ball/Itron
Type of Review (Desk, On-site, Full M&V, Tool)	Desk review
ED Recommendation	Savings not approved pending IOU submission of items described in this review

Measure Description

The key energy savings measures implemented as part of this central chiller plant upgrade project are as follows:

1. Decrease the nominal capacity of each chiller
2. Improve part load efficiencies due to VFD technology
3. Improve part load efficiencies due to better chiller design

Summary of Review

Documents provided for review include the following:

- Syska_Hennessy_Initial_Analysis.xlsx contains bin analysis of energy savings. Loads are hard coded, but savings calculations are live.
- Final_Chiller_Calcs.xls contains baseline part load performance curve calculations, bin analysis for energy savings. Plant Load is hardcoded but other calculations are live.
- XXXXX Bldg K - YORK YVAA Chiller Performance.pdf is the new chiller manufacturer's performance specifications
- ProjectScopeDescription_████.doc provides a description of the project and savings assumptions.
- Application_BuildingK_Chiller_PG2 .pdf is part of the program application.
- Application_BuildingK_Chiller_PG1.pdf is part of the program application
- 12MonthUsage_████.pdf contains monthly gas and electric usage for 2011 for three service accounts.
- Various correspondences between contractors, the site contact, and utility discussing project details.

Building K has been repurposed from office space into new lab space. The existing central plant was insufficient because the new lab space has higher internal heat loads. Therefore, the central plant was upgraded to handle the increase in heat load and improve efficiency. Two existing air-cooled chillers were replaced with three new 150 ton chillers. The third new chiller is redundant. According to the chiller savings calculations, peak demand reduction is estimated to be 78 kW and energy savings is estimated to be 685,545 kWh.

There are a number of questions on the savings methodology and assumptions:

1. T-24 baseline for air-cooled chillers under ARI 550/590 test procedure is listed as 1.256 kW/ton, which is inconsistent with the baseline in the savings calculations of 1.1 kW/on.
2. The baseline kW/ton is adjusted to account for a condenser water supply temperature (CWS) different than the ARI test conditions, at 85°F. However, there appears to be a calculation error. The adjusted kW/ton (with CWS at 95°F) is the same as the ARI test condition kW/ton. See ARI Baseline Chiller spreadsheet, cell K6 and rows 43 and 44, columns C through L.
3. The energy savings calculations use a flat load of 210 Tons. It is unclear how the load was determined and allocated across the chillers. There is a comment stating “Plant load was taken from data provided by Syska Hennessy above. According to Syska Hennessy this load was measured on site.” However there is no indication of how this was done. Was a spot reading used or was it monitored over a period? Was it taken from the existing chiller plant or the new chiller plant? The argument is made that the plant load will be relatively constant because it will be driven primarily by internal heat gains. However, further explanation is needed to determine if this is an appropriate assumption. Even if internal heat gain dominates the load, it is likely that there will be a weather-sensitive annual load profile.
4. The baseline equipment assumed is two Title-24 standard efficiency screw chillers. It is unlikely that the chillers would split the load equally; it is more likely that there would be lead/lag controlled.
5. The new equipment is three VFD controlled chillers. The load is distributed evenly amongst the three chillers. This is inconsistent with the Project Summary section in the Project Scope Description document, stating that the third chiller is for redundancy.

Review Conclusion

Savings not approved, pending fulfillment of requested data and subsequent opportunity for ED to re-evaluate the project and the savings analyses.

Summary of ED Requested Action by the IOU

In order to complete an ex ante review the ED recommends that the IOU submit the following documentation due on *04/4/2012* (or 14 days from submittal date to IOU):

1. Explain how the ARI baseline of 1.1 kW/ton was determined.
2. Develop savings using simulation software such as DOE2.2 or eQuest 3.64.
3. Explain how the chiller load was determined and provide any pre-installation metering data, when it becomes available.
4. Explain why the load is distributed evenly among baseline and new chillers.
5. Provide M&V plan and results when becomes available.

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6. Provide itemized project cost estimates, vendor proposals, and assumptions when available.

Table 1-2: Project Overview

Description	IOU Proposed Ex Ante Data	ED Recommendations
Project Baseline Type (Early Replacement, Normal Replacement, Capacity Expansion, New Construction, System Optimization, Add-on Measures)	New construction	New Construction
Project Cost Basis (Full Cost, Incremental Cost)	Appears to be the full cost, \$1,000,000	TBD; this is a new construction project, so incremental cost should be applied as the basis of the project cost
RUL (Early retirement projects only, otherwise N/A (not applicable))	N/A	N/A
EUL	Not provided	Review of 2008 DEER documentation indicates an EUL of 20 years for high efficiency chillers in non-res, HVAC applications
First Year kWh Savings	685,545	TBD
First Year Peak kW Savings	78.0	TBD
First Year Therms Savings	0	0
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 (EUL thru RUL Period)	Not provided	TBD
Peak kW Savings (EUL thru RUL Period)	Not provided	TBD
Therms Savings (EUL thru RUL Period)	N/A	N/A

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Description	IOU Proposed Ex Ante Data	ED Recommendations
Annual Non-IOU Fuel Impact (RUL Period)	N/A	N/A
Annual Non-IOU Fuel Impact (EUL thru RUL Period)	N/A	N/A
Net-to-Gross Ratio	Not provided	None at this time.

Table 1-3: Detailed Review Findings

Reviewed Parameter	Analysis
Project Gross Savings Baseline (for early retirement projects only, include RUL through EUL baseline)	IOU Proposal: New construction, major renovation
	ED Assessment: New construction is appropriate
	ED Recommendation: No changes
Project Cost Basis (for early retirement projects only, include RUL through EUL cost basis treatment)	IOU Proposal: Not provided
	ED Assessment: Could not assess because application documents and itemized invoice were not provided.
	ED recommendation: Provide itemized project cost estimates and incremental costs when available.
RUL (required for early retirement projects only, otherwise n/a)	IOU Proposal: N/A
	ED Assessment: N/A
	ED recommendation: N/A
EUL	IOU Proposal: N/A
	ED Assessment: Review of 2008 DEER documentation indicates an EUL of 20 years for high efficiency chillers in non-res, HVAC applications
	ED Recommendation: 20 years based on 2008 DEER
Savings Assumptions	IOU Proposal: Savings were projected based on bin-analysis
	ED Assessment: The load profile was flat throughout the year, it is unclear how this was determined, and if it is appropriate. Also, the load distribution across the

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Reviewed Parameter	Analysis
	chillers lacks explanation and seems inappropriate. The baseline kW/ton may be incorrect.
	ED Recommendation: Provide explanation of the plant load and its distribution among chillers. Conduct monitoring or trending of load with EMS. Explain how the baseline kW/ton was determined.
Calculation Methods/Tool review	IOU Proposal: Savings were projected using a bin analysis
	ED Assessment: Savings method is inappropriate are appropriate; there is an error with how the baseline kW/ton is adjusted for non ARI CWS.
	ED Recommendation: Suggest use DOE 2.2 or eQuest 3.64 to model energy use and energy savings.
Pre- or Post-Installation M&V Plan	IOU Proposal: No M&V plan was provided
	ED Assessment: completed&V would be valuable to true up savings estimates.
	ED Recommendation: Submit M&V plan.
Net-to-Gross Review	IOU Proposal: Not provided
	ED Assessment: An assessment was not preformed
	ED Recommendation: None at this time.

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