

## Ex Ante Review Findings

### Project Information

IOU	Pacific Gas and Electric
Application ID	2K12108487
Application Date	7/25/11
Program Number	
Program Name	Non-Residential Customized Retrofit
Program Year	2012
Project ID	2K12108487
IOU Ex Ante Savings Date	
Itron ID	X195
ED Measure Group Name	
IOU Measure Name	Turbocor Chiller Installation
End Use	Cooling
Date of ED Review	8/1/2013
Type of Review	Desk Review
Primary Reviewer and Firm	Doug Maddox, James J. Hirsch & Associates
ED Review and QC	Nikhil Gandhi, DMQC
ED Project Manager	[REDACTED]
ED Recommendation	Conditional approval subject to clarifications, corrections, and modeling Title 24 Baseline for the RUL through EUL period.

### Measure Description

The measure replaces two 100 ton screw compressors with two 100 ton Turbocor variable speed drive compressors. The existing chillers are 13 years old, and have a remaining useful life (RUL) of 7 years based on the DEER useful life of 20 years for a chiller.

### Summary of Review and Requested Utility Action Items

The measure analysis was performed using eQuest. Measurements of cooling load and power were used to adjust the cooling efficiency calculation in the proposed building model. The following issues were found in the review:

1. The hourly variation in load in the measured data is not nearly as large as in the model. A new load schedule should be established for the model based on the measured data. There appears to be some noise in the measured data, so hourly averages should be calculated to use as the basis for the new load schedules.

2. There is a surprising lack of variation in cooling power with outdoor temperature. Please clarify whether the condenser fans were included in the measured power data.
3. One issue that still needs to be addressed is the calculation of savings for the period after the remaining useful life (RUL). This requires a second baseline simulation for which the chiller just meets the 2013 Title 24 requirement of 2.8 COP (1.26 kW/Ton), which is slightly better than the existing chiller baseline. The total lifetime savings is then calculated as the sum of the accumulated savings during the RUL period and the EUL savings after the RUL period.
4. Please submit simulation input and output files.

Description	IOU Proposed Ex Ante Data	IOU Proposed Ex Post Data	ED Recommended Changes
Project Baseline (Early Replacement, Normal Replacement, Capacity Expansion)	New Construction	New Construction	Accept
Project Cost Basis (Full Cost, Incremental Cost)	Compressor cost \$164,000	Compressor cost \$164,000	Accept
RUL	7 years	7 years	None
EUL	20 years	20 years	None
kWh Savings through RUL	395,000	355,660	See summary above
KW Savings through RUL per CPUC Definition	51.8	76.2	See summary above
Therms Savings through RUL	n/a	n/a	None
kWh Savings through EUL	Not reported	Not reported	Savings vs. 2013 Title 24
KW Savings through EUL	Not reported	Not reported	Savings vs. 2013 Title 24
Therms Savings through EUL	n/a	n/a	n/a

Description	IOU Proposed Ex Ante Data	IOU Proposed Ex Post Data	ED Recommended Changes
Lifetime Savings kWh	Not reported	Not reported	Calculate as sum of RUL and EUL savings
Lifetime Savings KW	Not reported	Not reported	Calculate as sum of RUL and EUL savings
Lifetime Savings Therms	n/a	n/a	n/a
Secondary Impact kWh	n/a	n/a	n/a
Secondary Impact KW per CPUC Definition	n/a	n/a	n/a
Secondary Impact Therms	n/a	n/a	n/a
Interactive Effects kWh	n/a	n/a	n/a
Interactive Effects Therms	n/a	n/a	n/a
Net-to-Gross Ratio	Not stated	Not stated	None

### Detailed Review Findings

Reviewed Parameter	Analysis
<b>Project Baseline</b>	IOU Proposal: Existing air-cooled chiller, installed in 1999. Rated efficiency is 1.3 kW/Ton. Minimum condensing temperature was run at 75°F.
	ED Assessment: Measured load profile does not match model. 2013 Title 24 baseline is needed.
	ED Recommendation: Calibrate model to match measured load profile. Add 2013 Title 24 baseline.
<b>Project Cost Basis</b>	IOU Proposal: Incremental estimated costs are described in "2K12108487 – COM_2012 PG&E Review Form v1.2.xlsm" \$164,000 for compressors only

Reviewed Parameter	Analysis
	<p>ED Assessment: Seems reasonable.</p> <p>ED recommendation: Accept.</p>
<b>RUL</b>	<p>IOU Proposal: Existing chiller is 13 years old, and DEER EUL for chillers is 20 years. Hence, RUL is 7 years.</p>
	<p>ED Assessment: Correct</p>
	<p>ED Recommendation: Accept</p>
<b>EUL</b>	<p>IOU Proposal: 20 years</p>
	<p>ED Assessment: 20 years</p>
	<p>ED Recommendation: Accept</p>
<b>Savings Assumptions</b>	<p>IOU Proposal: The eQuest model for the simulation was not available for review.</p>
	<p>ED Assessment: None</p>
	<p>ED Recommendation: Please submit eQuest input and output files.</p>
<b>Calculation Methods/Tool review</b>	<p>IOU Proposal: Analysis done using eQuest. Simulation input and output files not available for review. Measurement data were used to update cooling efficiency for proposed model, but loads were not updated.</p>
	<p>ED Assessment: Need to review simulation files.</p>
	<p>ED Recommendation: Please submit simulation input and output files. Calibrate loads in both baseline and proposed models based on hourly averages of measured load.</p>

Reviewed Parameter	Analysis
<p align="center"><b>Pre- or Post- Installation M&amp;V Plan</b></p>	<p>IOU Proposal: Data were collected for chilled water loop temperatures, flow rate, and cooling power.</p>
	<p>ED Assessment: Not clear whether power measurements include condenser fan power.</p>
	<p>ED Recommendation: Please clarify.</p>
<p align="center"><b>Net-to-Gross Review</b></p>	<p>IOU Proposal: Not stated</p>
	<p>ED Assessment: None</p>
	<p>ED Recommendation: None.</p>