Final 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 Reviews	8/1/2013, 9/14/2013
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	Ex ante first year savings of 345,800 kWh and 29.1 KW are approved.

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

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.

   IOU Response:

The measured load is much more constant than the eQUEST model predicted: the intercept is higher and the angular coefficient of the linear regression lower. However the total load in ton-hr is very similar in both cases. The reviewer used the post monitored data to recalculate the baseline consumption based on the baseline efficiency. Hourly averages were also calculated.

ED Recommendation:
Accept.

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.

   IOU Response:
   That's correct it is a little flat. Condenser fan were not originally included. The reviewer added the consumption of the condenser fans which would reduce the savings by a 26,200 kWh and 8.8 kW.

   ED Recommendation:
   Accept.

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.

   IOU Response:
   The second baseline was evaluated and so were the related savings.

   ED Recommendation:
   Accept.

4. Please submit simulation input and output files.

   IOU Response:
   Everything is attached in the zip file.

   ED Recommendation:
   Accept.

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	345,800	Accept
KW Savings through RUL per CPUC Definition	51.8	29.1	Accept
Therms Savings through RUL	n/a	n/a	None
kWh Savings through EUL	Not reported	314,500	Accept
KW Savings through EUL	Not reported	26.1	Accept
Therms Savings through EUL	n/a	n/a	n/a
Lifetime Savings kWh	Not reported	Not reported	6,509,100
Lifetime Savings, average KW	Not reported	Not reported	27.1
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
Project Baseline	IOU Proposal: Existing air-cooled chiller, installed in 1999. Rated efficiency is 1.3 kW/Ton. Minimum condensing temperature was run at 75°F. Title 24-2013 as baseline for RUL.
	ED Assessment: Correct.
	ED Recommendation: Accept.
Project Cost Basis	IOU Proposal: Incremental estimated costs are described in "2K12108487 – COM_2012 PG&E Review Form v1.2.xlsm" $164,000 for compressors only
	ED Assessment: Seems reasonable.
	ED recommendation: Accept.
RUL	IOU Proposal: Existing chiller is 13 years old, and DEER EUL for chillers is 20 years. Hence, RUL is 7 years.
	ED Assessment: Correct
	ED Recommendation: Accept
EUL	IOU Proposal: 20 years
	ED Assessment: 20 years
	ED Recommendation: Accept
Savings Assumptions	IOU Proposal: The eQuest model for the simulation has been submitted.
	ED Assessment: Basic assumptions are reasonable.

Reviewed Parameter	Analysis
	ED Recommendation: Accept.
Calculation Methods/Tool review	IOU Proposal: eQuest model was used to estimate hourly cooling efficiency, hourly loads were based on measurement data.
	ED Assessment: Methods are reasonable.
	ED Recommendation: Accept.
Pre- or Post-Installation M&V Plan	IOU Proposal: Data were collected for chilled water loop temperatures, flow rate, and cooling power. New calculations were added to analysis workbook to account for condenser fan power.
	ED Assessment: Reasonable.
	ED Recommendation: Accept.
Net-to-Gross Review	IOU Proposal: Not stated
	ED Assessment: None
	ED Recommendation: None.