

Energy savings are expected to accrue due to the elimination of the CRAH circulation fans. The rear door units consume essentially no energy, and the pump energy associated with the CDU is small relative to the baseline CRAH fans.

The post-installation verification is documented in the EMCOR report prepared for PG&E dated July 18, 2012. The project as installed was modified somewhat from the original proposal. Only 4 high density server racks were installed, instead of 6. Initially, the passive in-row rear-door heat exchangers were not installed, and two CRAC units were installed instead. After installation, it was decided to proceed with the project, and the CRAC units were removed. Because the energy savings were based on the elimination of two CRAC fans, energy savings are similar. Because CRACs were removed rather than avoided, the total project cost is applicable rather than incremental.

Peak electrical savings are projected to be 11.7 kW, which is the difference between the CRAH fan energy consumption (including cooling energy saved by the reduction in fan heat) and the CDU pump energy consumption. As this is a data center, savings are expected to be constant 8760 hours/year, or 102,548 kWh/year. The incremental cost was originally estimated to be \$36,784, and the incentive is \$16,553. The actual installed cost was considerably greater than estimated, and the incentive does not exceed the 50% cap.

Summary of Review

Baseline CRAH fan energy was calculated in accordance with "Energy Efficiency Baselines for Data Centers, October 2009", and appears correct. At the time of this review, the current baseline document is "Energy Efficiency Baselines for Data Centers, November 2011, effective January 2012". For air management schemes, the 2012 baseline adds a Scheme IV for very high density racks which requires devices such as rear door units, however this project is below the Scheme IV minimum power density. For Scheme III, assumptions are unchanged between the 2009 and 2012 baselines.

The measure analysis assumes that all CRAH fan energy can be eliminated, and that the increase in static pressure drop due to the rear door coil is negligible compared to the perforated grill that would otherwise exist. Otherwise the server fan energy could increase.

The pump energy calculations for the Coolant Distribution Unit originally underestimated the pump head of the secondary loop pump, but this was corrected in the EMCOR post-installation report.

ED's original review identified additional chiller plant energy savings that would accrue due to the reduction in load due to fan energy savings. These savings were included in the EMCOR report. The EMCOR report did not present the calculation for these savings, but the savings are consistent with what ED would expect.

Note that the reported savings are for Phase II, which is a pilot project for a much larger Phase III installation. Fan energy savings cannot be directly extrapolated from Phase II to Phase III.

This is because Phase II requires two air handlers in the baseline to satisfy airflow and redundancy requirements, and as a result operates with an airflow TD of 11°F. As Phase III is much larger, the number of redundant units in the baseline will be significantly smaller, and the TD significantly higher. Baseline fan energy savings will therefore be significantly smaller. In addition, a few CRAHs may still be required to provide filtration and possibly dehumidification.

Description	IOU Proposed Ex Ante Data	ED Recommended Changes
Project Baseline (Early Replacement, Normal Replacement, Capacity Expansion)	Capacity Expansion	Accept
Project Cost Basis (Full Cost, Incremental Cost)	Incremental Cost	Accept
RUL	Not applicable	
EUL	Not stated	Recommend five years
kWh Savings through RUL	Not applicable	
KW Savings through RUL per CPUC Definition	Not applicable	
Therms Savings through RUL	Not applicable	
kWh Savings through EUL	102,548 kWh/year	Accept
KW Savings through EUL	11.7 kW	Accept
Therms Savings through EUL	Not applicable	
Lifetime Savings kWh	Not mentioned	512,740 kWh
Lifetime Savings KW	11.7 kW	Accept
Lifetime Savings Therms	Not applicable	
Secondary Impact kWh	Reduction in cooling energy due to reduction in fan heat is included	Accept
Secondary Impact KW per CPUC Definition	Reduction in cooling energy due to reduction in	Accept

Description	IOU Proposed Ex Ante Data	ED Recommended Changes
	fan heat is included	
Secondary Impact Therms	Not applicable	
Interactive Effects kWh	Not applicable	
Interactive Effects Therms	Not applicable	
Net-to-Gross Ratio		

Detailed Review Findings

Reviewed Parameter	Analysis
Project Baseline	IOU Proposal: Phase II load consists of 4 server racks at 16 kW per rack. The load density requires Data Center Air Management Scheme III (hot and cold aisles), consisting of two airhandlers providing (N+1) redundancy. The baseline fan energy is calculated using "Energy Efficiency Baselines for Data Centers, October 2009".
	ED Assessment: CRAH fan energy was calculated in accordance with 2009 Data Center Baseline document, but methodology is unchanged in 2012 Baseline document.
	ED Recommendation: Accept as proposed.
Project Cost Basis	IOU Proposal: As racks and CRACs were already installed prior to the decision to proceed with this project, full project costs are applicable
	ED Assessment: Concur

Reviewed Parameter	Analysis
	ED recommendation: Accept as proposed
RUL	IOU Proposal: Not applicable
	ED Assessment:
	ED Recommendation:
EUL	IOU Proposal: Not defined
	ED Assessment: Suggest use five years since heat exchangers are tied to servers that might be replaced sooner.
	ED Recommendation: Five years.
Savings Assumptions	IOU Proposal: The baseline has more fan energy and central plant cooling energy; the measure has more pump energy. Peak savings are projected to be 11.7 kW, constant for 8760 hours. Overall savings are 102,548 kWh/year
	ED Assessment: The calculation for savings in central plant cooling energy are not presented, but the stated central plant savings are consistent with what ED would expect.
	ED Recommendation: Accept

Reviewed Parameter	Analysis
<p style="text-align: center;">Calculation Methods/Tool review</p>	<p>IOU Proposal: Spreadsheet calculations assuming constant energy usage all hours.</p>
	<p>ED Assessment: Savings are principally due to the elimination of CRAH fans. Savings are expected to be relatively independent of the weather, and relatively constant.</p>
	<p>ED Recommendation: Accept as proposed.</p>
<p style="text-align: center;">Pre- or Post- Installation M&V Plan</p>	<p>IOU Proposal: Primary loop supply temperature, flow and pump power. Secondary loop supply temperature, flow and pump power. Rack power demand</p>
	<p>ED Assessment:</p>
	<p>ED Recommendation:</p>
<p style="text-align: center;">Net-to-Gross Review</p>	<p>IOU Proposal: Not provided</p>
	<p>ED Assessment: None</p>
	<p>ED Recommendation: No recommendation</p>

