Phase 1 Ex Ante Review Findings

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

IOU	PG&E
Application ID	HEEP-89
Application Date	Not provided (5/31/2013 approved for implementation per Engineering Report Review)
Program ID	PGE2206
Program Name	Healthcare Energy Efficiency Program (HEEP)
Program Year	2012
Itron Project ID	X361
IOU Ex Ante Savings Date	5/31/2013
ED Measure Name	RCx & Retrofit Measures
Project Description	This project includes a total of 6 measures as follows: • EEM 1, Chilled water and hot water temperature supply temperature reset • EEM 2, Condenser water temperature reset • EEM 3, Install variable speed drives (VSD)s on primary and secondary chilled water pumps • EEM 4, Supply air temperature reset • EEM 5, Install dedicated HVAC units in data rooms • EEM6, Install high efficiency parking lot lighting
Date of ED Review(s)	6/10/2013
Primary Reviewer / Firm	Dale Tutaj / DNV KEMA Inc
Review Supervisor / Firm	Joseph Ball/ Itron
ED Project Manager	[redacted] / California Public Utilities Commission, Energy Division
ED Policy Authorization (as needed)	
Type of Review (Desk, On-site, Full M&V, Tool)	Desk
ED Recommendation	RUL savings are conditionally approved, pending submission of RUL through EUL

	savings estimates, subject to ED verification of pre-implementation conditions, post M&V activities, and IOU true-up.

Measure Description

This project involves equipment servicing one hospital building and one medical office building (MOB 2) and the associated central plant. The hospital and MOB 2 cover approximately [redacted] ft^2. A total of 6 measures were implemented as follows:

- EEM 1, Existing chiller controls provide chilled water supply temperature (CHWST) at 44°F from either the one, 1,000 ton centrifugal water-cooled chiller with a variable frequency drive VFD or the one, 400 ton gas engine water-cooled chiller. The CHWST is reset from 44°F to 50°F depending on the cooling load. The control parameter is either cooling load or outside air temperature (OAT) used as a proxy for building load. Similarly space heating was provided by three 10,000 MBH gas-fired water tube water boilers and two 7,000 MBH gas-fired water tube steam boilers with constant hot water supply temperature (HWST) of 180°F. Adjusting the HWST from 180°F to 150°F depending on the heating load yields energy savings.
- EEM 2, Heat rejection is provided by two 960 ton induced draft, cross flow cooling towers with VFD-controlled fans, and one 480 ton induced draft, cross flow cooling tower with VFD-controlled fans that operate with a condenser water supply temperature (CWST) of 80°F to 85°F. By decreasing the CWST to as low as 60°F based on outside air conditions, chiller efficiency will be improved.
- EEM 3, Install VFDs on primary and secondary chilled water pumps. Two 20 hp constant speed pumps service the electric chillers, and one 7.5 hp constant speed pump serves the gas engine chiller. VFD controls allow the pumps to operate at a speed necessary to maintain the required minimum flow from the chillers.
- EEM 4, Air handling units (AHUs) provide constant supply air temperature (SAT) of 55°F. The SAT reset adjusts the supply air temperature setpoint based on cooling load, from 55°F to 60°F in non-critical zones, and 55°F to 56°F in critical zones. This measure helps reduce the amount of reheat needed. There are a total of 23 AHUs of nominal flow capacities ranging from 46,000 cfm to 10,735 cfm.
- EEM 5, IT, telecom, and power distribution loads are stable and not occupancy-dependent. By installing dedicated split system cooling units to serve these loads in MOB 2 the associated existing large AHU will not need to operate during unoccupied periods.
- EEM6, The existing 131, 250 watt and 51, 175 watt Metal Halide lamps and ballasts in the parking lot will be replaced with 131, 92 watt and 51 49 watt bi-level LED fixtures with passive infrared occupancy sensors and photocells. Some of the existing fixtures had photocell sensors.

The total energy savings for this project are 1,495,586 kWh, 35.1 kW and 173,963 therms. The estimated project cost is $366,420 and the estimated total application incentive is $183,210.

Summary of Review

The Investor Owned Utility (IOU) submitted the following documents in response to the Data Request (DR) ED_421 (EEGA 6822) for this Phase 1 review:

- Transmittal Memorandum for DR X361;
- 3P RCx Review-HEEP [redacted] 053113.pdf is the energy report review;
- HEEP-89_CalculationSummary_05.14.2013.xlsx
- HEEP-89_[redacted]_AuditReport_rev1_05.29.2013.pdf
- eQuest model files including .inp, .pd2, .pdl, and .prd files

The documentation provided in the initial data request was sufficient for completing this phase 1 review. All the proposed measures for this project are eligible.

Savings are calculated using a building simulation for measures EEM 1 through EEM 4. The building simulation is calibrated using monthly gas and electric bills from March 2012 through February 2013 and climate zone data. This method is appropriate since the measures involve control modifications which include interactive savings across measures.

Savings for measures EEM 5 and EEM 6 are calculated using a spreadsheet analysis. This approach is appropriate for these measures. EEM 5 involves installing a local, dedicated HVAC system instead of the AHUs operating during unoccupied hours. EEM 6 involves a lighting retrofit in an unconditioned space. Incorporating these two measures into the building simulation is not warranted.

Measure Assessments:

- EEM 1, resetting CHWST and HWST based on loads; use the existing fixed temperature setpoints for the baselines. Using the existing conditions for this add-on measure is appropriate.
- EEM 2, decreasing the CWST as low as 60°F based on outside air conditions is an add-on measure. It is appropriate to use the existing conditions for this add-on measure.
- EEM 3, Install variable speed drives on primary and secondary chilled water pumps is also an add-on measure. Two 20 hp constant speed pumps service the electric chillers, and one 7.5 hp constant speed pump serves the gas engine chiller. VFD controls allow the pumps to operate at a speed required to maintain the minimum flow required by the chillers.
- EEM 4, Air handling units (AHU)s provide constant supply air temperature (SAT) of 55°F. Supply air temperature reset adjusts the supply air temperature setpoint based on cooling load, from 55°F to 60°F in non-critical zones, and 55°F to 56°F in critical zones. This measure helps reduce the amount of reheat needed. There are a total of 23 AHUs of nominal flow capacities ranging from 46,000 cfm to 10,735 cfm.
- EEM 5. By installing dedicated split system cooling units to serve IT loads in the MOB 2 the associated existing large AHU will not need to operate during unoccupied periods.

Savings for this measure were calculated using an engineering spreadsheet and are derived from the difference between the existing AHU and cooling usage and the new AHU schedule and new HVAC equipment. This method is appropriate to determine savings since the majority of savings result for the schedule change of the AHU, which will have negligible interactive effects. Additionally, the HVAC load is relatively constant. Therefore the effort needed to incorporate this measure into the eQuest model is warranted.

- EEM6. Some of the existing fixtures had photocell sensors. Savings for this measure were calculated using an engineering spreadsheet based on existing and new wattages and operating hours. This methodology is sufficient as interactive effects do not need to be accounted for because lighting is in unconditioned space.

Review Conclusion

The ex-ante savings are conditionally approved for the first year and RUL savings pending submission of post M&V data collection and IOU true-up. Additionally, RUL through EUL period savings need to be determined for EEM 6.

Summary of ED Requested Action by the IOU

In order to complete the review of this project and finalize ex ante energy savings ED requests that the IOU undertake the following recommended steps::

1. For EEM 6, determine the EUL period using the rated lamp life divided by the annual operating hours. Also assess and submit the RUL of the existing equipment.
2. For EEM 6 assess EUL through RUL period savings using code as the baseline.
3. Provide the incremental measure costs for EEM 6.
4. Utilize the ED-suggested M&V plan listed in Table 1-2, below and submit collected M&V data to ED for review.

Table 1-2 Review Findings

Reviewed Parameter	Analysis
Project Baseline Type (Early Replacement, Normal Replacement, Capacity Expansion, New Construction, System Optimization, Add-on Measures) Note: For early	IOU Proposal: ■ EEMs 1 – 5: Add-on Measures; ■ EEM 6: Early Replacement.
	ED Assessment: The baseline types are appropriate.
	ED Recommendation: The proposed baseline types should be used.

Reviewed Parameter	Analysis
retirement projects only, include RUL through EUL baseline)	
Project Baseline Technology (in situ equipment, Title 24 (specify year), other code or other efficiency level (specify), industry standard practice - ISP)	IOU Proposal: ■ EEMs 1 - 6: in situ equipment through the EUL period; ■ EEM6: in situ equipment for the RUL period; code baseline applies for the EUL – RUL period.
	ED Assessment: The baseline technologies are appropriate.
	ED Recommendation: The proposed baseline technologies should be used.
Project Cost Basis (Full Incremental, or Both. Note: For early retirement projects, include RUL through EUL cost basis treatment)	IOU Proposal: The source of estimates and basis of cost estimates were not provided, ■ EEM 1: ($22,905) ■ EEM 2: ($28,500); ■ EEM 3: ($85,550); ■ EEM 4: ($83,654); ■ EEM 5: ($147,550); ■ EEM 6: ($99,255).
	ED Assessment: ■ EEMs 1 – 5: Full costs ■ EEM6: Both full & incremental costs apply
	ED recommendation: Upon project implementation provide itemized invoices EEM 6 should be broken out
RUL (required for early retirement projects only, otherwise N/A)	IOU Proposal: ■ EEMs 1 – 5: N/A ■ EEM 6: The 3P implementer has indicated that the existing equipment is 5 years old. RUL not provided.
	ED Assessment: For EEM 6 the DEER EUL varies by building type using the rated ballast life. Since these lights are in a parking lot, the annual operating hours of fixtures should be calculated using the following equation: EUL = Rated Life of Ballast (70,000 hours) / Annual usage.
	ED recommendation: For EEM 6 use ballast life and annual operating hours to determine EUL.
EUL (for each measure)	IOU Proposal: Not provided
	ED Assessment: EULs should be determined using DEER 2008 and ■ EEMs 1 & 2: Water loop reset, 10 years according to DEER 2008; ■ EEMs 3 & 4: EUL of 15 years for VSD on water loop according to DEER 2008;

Reviewed Parameter	Analysis
	■ EEM 5: For non-residential air conditioners and split systems DEER 2008 lists an EUL of 15 years; ■ EEM 6: Use rated lamp life divided by the annual operating hours.
	ED Recommendation: Use DEER 2008 values, listed above, and rated lamp life for EEM 6
Savings Assumptions	IOU Proposal: The existing conditions are used as the baseline. By using a building simulation for measures EEM 1 through EEM 4, and not EEM 5, it is assumed that the reduction in cooling load by EEM 5 will not significantly impact the savings calculated by the building simulation.
	ED Assessment: The cooling reduction from EEM 5 is less than 5% of the total energy savings of the project. Incorporating EEM5 into the building model is not warranted by the improvement in accuracy.
	ED Recommendation: The existing assumptions are appropriate.
Calculation Methods/Tool review	IOU Proposal: ■ EEM 1 through EEM 4: An eQuest building simulation is used. The building simulation is calibrated using monthly gas and electric bills from March 2012 through February 2012. ■ EEM 5 utilizes a weather dry-bulb bin analysis. Savings are the difference between the baseline (AHU and chiller load) and the post case (supply fan and proposed split system load). ■ For EEM6 an engineering calculation spreadsheet was used.
	ED Assessment: ■ For EEM 1 through EEM 4, a more accurate way to calibrate the model would be to use local weather data corresponding to the utility billing period. However, it is not expected that this will change the model more than +/-20%. A building simulation approach is an appropriate method for estimating savings of these measures. The calibrated model could also be improved by removing the parking lot lighting energy usage from the utility bills. ■ For EEM 5 the weather dry-bulb bin analysis is adequate.. ■ EEM6, engineering calculation spreadsheet is adequate.
	ED Recommendation: None
Pre- or Post-Installation M&V Plan	IOU Proposal: ■ EEM 1: Obtain and analyze two weeks of system-trend data to verify that the temperature reset schedules are active. ■ EEM 2: Obtain and analyze two weeks of system-trend data to verify that the temperature reset schedule is active. ■ EEM 3: Obtain and analyze two weeks of system-trend data to

Reviewed Parameter	Analysis
	validate the VFD pump modulation. ■ EEM 4: Obtain and analyze two weeks of system-trend or logger data to validate that the temperature reset schedules are active. ■ EEM 5: Obtain and analyze two weeks of system-trend or logger data to demonstrate the reduced operating schedule for the affected AHUs. ■ EEM6: Verify quantities using final invoices and control schedules
	ED Assessment: The proposed M&V activities were vague. Monitoring should be conducted upon completion of the project to verify savings estimates and make revisions to the building simulation, if appropriate. A range of weather and operating conditions should be captured to ensure representative data. The following data points should be collected for a minimum of six to eight weeks, at 15-minute intervals or shorter: ■ EEM 1: Supply and return water temperatures, outside air temperature, flow rate, chiller loading ■ EEM 2: Condenser water temperature, flow rate ■ EEM 3: VFD frequency, power, flow rates ■ EEM 4: Supply air temperatures on sample of AHUs, ■ EEM 5: AHUs operation schedules, fan speed, ■ EEM6: This approach is acceptable as the assumptions are reasonable and the uncertainty and potential error introduced with developing annual operating schedules from monitoring data is not warranted by the savings.
	ED Recommendation: Savings should be verified using post M&V activates listed above.
Net-to-Gross Review	IOU Proposal: Not provided
	ED Assessment: A net-to-gross interview may be warranted.
	ED Recommendation: TBD

Table 1-3 Energy Savings Summary

Description	IOU Ex Ante Claim	ED Recommendations
First Year kWh Savings	1,495,586	1,495,586
First Year Peak kW Savings	35.1	35.1
First Year Therms Savings	173,963	173,963
kWh Savings (RUL Period)	1,495,586	1,495,586

Description	IOU Ex Ante Claim	ED Recommendations
Peak kW Savings (RUL Period)	35.1	35.1
Therms Impact (RUL Period)	173,963	173,963
kWh Savings (RUL thru EUL Period)	Not provided	TBD
Peak kW Savings (RUL thru EUL Period)	Not provided	TBD
Therms Savings (RUL thru EUL Period)	Not provided	TBD
Annual Non-IOU Fuel Impact (RUL Period)	None	None
Annual Non-IOU Fuel Impact (RUL thru EUL Period)	None	None