Final Phase II Ex Ante Review Findings

Table 1-1: Project Information

IOU	Pacific Gas & Electric
Application ID	2K12128938 *Note: The original application was split into two phases in order to accommodate for the post-implementation M&V efforts. The four CZ12 stores were re-submitted under the original application ID while the remaining eight stores in CZ 13 and 2 will be re-submitted in 2014, under a separate application ID, 2K13218307 (X260A).*
Application Date	11/27/2012
CMPA Sample Date	11/28/2012
Program ID	PGE22011
Program Name	Commercial Calculated Incentives
Program Year	2012
Itron Project ID	X260
IOU Ex Ante Savings Date	11/5/2013; original savings date for the PA review of all 12 stores combined was 12/28/2012
CPUC Staff Measure Name	Evaporative Coolers
Project Description	Evaporative Cooler retrofits for existing rooftop units at four (4) separate large retail stores in CZ12.
Date of CPUC Staff Review(s)	December 3, 2013
Primary Reviewer / Firm	Chris Williams / DNV KEMA
Review Supervisor / Firm	Joseph Ball / Itron Inc.
CPUC Staff Project Manager	Peter Lai / California Public Utilities Commission, Energy Division
CPUC Staff Policy Authorization (as needed)	
Type of Review (Desk, On-site, Full M&V, Tool)	Desk
CPUC Staff Recommendation	Waive review of the re-submitted ex ante project savings for the four CZ12 stores and apply 0.9 GRRs to the IOU claimed savings of 185,100 kWh and 292 kW. All CPUC Staff Requested Actions are directed for the

	phase 2 submission (X260A) and project records for X260

Measure Description

This retrofit project originally proposed to install Integrated Comfort Dual Cool evaporative coolers on a total of 92 existing rooftop units (RTU) serving twelve (12) big box retail stores located in three California climate zones within PG&E service territory (CZ12, CZ13, and CZ 2).

The PG&E project application (2K12128938) was selected by CPUC staff for ex ante review, with the phase I review performed in April 2013. That application submittal included twelve stores in climate zones 2, 12, and 13. This project application is a re-submittal that breaks the original project into two phases, and includes only the stores that are located in climate zone 12. The remaining eight stores (located in either climate zone 2 or 13) are to be implemented in the second phase of the project after post-implementation M&V is completed in the third quarter of 2014. When complete, the M&V data (for the "phase 2" stores in climate zone 2 and 13) and re-calculated ex ante savings will be submitted for CPUC staff review.

The "phase 1" project ex ante savings were approved by IOU technical reviewers and are claimed to be 185,100 kWh, 292 kW with a calculated incentive of $56,965 and a total project cost of $171,356.50.

Summary of Review

The Investor-Owned-Utility (IOU) submitted the following documents for project ID 2K12128938 (EEGA 2691) for this Phase II review:

- IOU Technical Review workbook;
- IR Savings Summary workbook; and
- Invoice documents showing materials and non-taxable items (labor, permit, warranty), aggregated by store.

CPUC staff determined that the re-submittal of the phase 1 project application and pertinent documentation failed to adhere to the CPUC staff requested actions that were listed in the Phase I EAR. Specifically, the following two (2) tasks were not addressed:

1. The re-submitted savings were not trued-up (*or it was unclear in the submitted documentation that the four stores' savings workbooks were trued up with verified observations*) with site-specific conditions as directed by point #6 in the Phase I EAR. These "conditions" include parameter input values in the AESC DualCool calculation workbooks that did not require time-series metering (i.e., only site-specific verification), such as number of retrofitted units, RTU flow rate, DualCool cut in temperature set point, supply air temperature set point, and economizer on/off function;

2. The submitted documentation does not attempt to disaggregate the included invoices by individual unit as directed in the Phase I EAR; the invoices only show costs by store but without a verified number of units retrofitted, a "per unit" cost cannot be estimated. It appears that with the invoices and verified number of units retrofitted, disaggregated cost per unit for both 10 ton and 20 ton DualCool retrofits can be calculated.

Although the re-submittal of the "phase 1" project application did not address some of the ED-requested actions, the AESC study (ET project number ET12PGE3181) and associated DualCool post-implementation M&V data collection efforts that were completed in 2012 provide a reasonable savings estimate for DualCool retrofits on RTUs in climate zone 12[1]. However, for the eight (8) "phase 2" stores (in CZ2 and 13), verification and utilization of critical calculation workbook parameter inputs will be required for a sample of store RTUs to ensure that the workbooks are being properly used and that savings are adjusted to as-found, post-install conditions as described in the Summary of CPUC Staff Requested Action by the IOU section below. Verification of workbook parameter input values will need to be submitted for CPUC Staff review in the form of photos, EMS screenshots and nameplate specifications for the retrofitted RTUs at the sampled stores (one CZ2 and one CZ13 store).

Review Conclusion

Waive review of the re-submitted ex ante project savings for the four CZ12 stores and apply 0.9 GRRs to the IOU claimed savings of 185,100 kWh and 292 kW.

Summary of CPUC Staff Requested Action by the IOU

CPUC Staff requests that the IOU undertake the recommended steps and submit the following information **when the "Phase 2" (for 2K13218307, X260A) project application is re-submitted for CPUC staff review**:

1. As part of the post-implementation review *for X260A*, verify individual store and unit fan controls, setpoints, and schedules to ensure the savings workbooks correctly model each phase 2 store's RTU schedule and operation. The savings workbooks should incorporate any site specific RTU/AHU schedules that are not already reflected in the workbook inputs. The post-implementation review will also include true-up of the savings estimates using the savings workbooks using adjusted inputs. Verification can be proven by submitting photos or screenshots (in the Installation Review) that show the site-specific parameter values reflected in each of the store's AESC DualCool savings calculation workbook. Additionally, photos of the each retrofitted unit and their nameplate specifications should be submitted in the Installation Review workbook. A sample store

[1] See the Phase I EAR for PGE 2K12128938 for details on data collected as part of the DualCool retrofit project M&V for climate zone 12 stores and the AESC study.

from each climate zone (i.e., one store in CZ2 and one store in CZ13) will be chosen to verify input parameter values;

2. After installation and commissioning maintain site specific project costs disaggregated by individual unit (i.e., 10 ton and 20 ton retrofit costs). Maintain these actual costs in the re-submitted IR savings summary and PG&E project review workbook;
3. Maintain evidence that the customer is participating in a quality maintenance program that provides support to the retrofitted units for at least 3 years. A previous discussion between CPUC staff and PG&E determined (verbally) that the stores have a PM contract for 2 years, but no documentation was provided for "phase 1" to verify the contract. Phase 2 store maintenance contracts will be required;
4. Maintain a post-implementation commissioning (M&V) report (as planned to be completed in 3Q2014) that substantiates the key parameters involved in the calculation workbooks. The commissioning should report the following parametric data trends: power consumption, both outside air dry and wet bulb temperatures, both after-condenser coil dry and wet bulb temperatures, and the temperature of the outside air pre-cooler in order to adjust the evaporation effectiveness factors (condenser pre-cooling and OAT pre-cooling), the Dual Cool "cut-in" temperature, and percent outside air intake ("OAT %"). The results of the post-implementation M&V will be applied to the savings workbooks to true-up the ex ante savings estimates;
5. Maintain a source for the effective useful life (EUL) of the evaporative cooling equipment. A previous discussion between CPUC Staff and PG&E estimated (verbally) that the DualCool EUL is 12 years while the evaporative media has an EUL of 5 years; however, documentation of these estimates are requested.

Table 1-2 Review Findings

Reviewed Parameter	Analysis
Project Baseline Type (Early Replacement, Normal Replacement, Capacity Expansion, New Construction, System Optimization, Add-on Measures, Major Renovation) Note: For early retirement projects only, include RUL through EUL baseline)	IOU Proposal: Add-on Measure. Project baseline is existing equipment
	CPUC Staff Assessment: Add-on measure baseline is acceptable
	CPUC Staff Recommendation: None
Project Baseline Technology (in situ equipment, Title 24 (specify year), other code or other efficiency level (specify), industry standard practice - ISP)	IOU Proposal: in situ equipment
	CPUC Staff Assessment: The IOU proposal is acceptable
	CPUC Staff Recommendation: None
Project Cost Basis (Full Incremental, or Both. Note: For early retirement projects, include RUL through EUL cost basis treatment)	IOU Proposal: Full cost
	CPUC Staff Assessment: This is a retrofit project so full cost basis is appropriate.
	CPUC Staff Recommendation: None
RUL (required for early retirement projects only, otherwise N/A)	IOU Proposal: N/A
	CPUC Staff Assessment: N/A
	CPUC Staff Recommendation: N/A
EUL (for each measure)	IOU Proposal: 12 years
	CPUC Staff Assessment: 12 years appears to be a reasonable estimate; however, the EUL and effectiveness of the DualCool retrofit is very dependent on the maintenance of modules such as evaporative media, filters, and condensing coils/fins. These modules have a much lower EUL (estimated at 5 years) than the retrofit in aggregate.
	CPUC Staff Recommendation: Maintain documentation that supports both of the EULs for the DualCool system and the DualCool modules that are covered under the PM contract.
Savings Assumptions	IOU Proposal: Savings assumptions include: ▪ Equipment operation and performance specifications (e.g., unit zie in

Reviewed Parameter	Analysis
	tons, number of units retrofitted at store, RTU flow rate ("Total RTU CFM"), DualCool flow rate ("DC CFM") ▪ Evaporation effectiveness factors of 40% and 80% for OAT pre-cooling and condenser pre-cooling, respectively; ▪ Percent outside air in mixed air stream ("OAT[%]") = 15% ▪ DualCool evaporative cooling cut in temperature ("DC cut in") = 65°F ▪ Supply air temperature set point ("SA Temp [F]") = 60 ▪ Economizer present/functional (Yes/No)
	CPUC Staff Assessment: Savings assumptions do not account for internal loads, equipment schedules, or solar heat gain. Hourly cooling demand is based solely on hourly outdoor air temperatures. This method is reasonable considering the building type and schedules of big box retail stores (most are 24 hours; some are 12-18 hours but are only closed for stocking purposes). Additionally, the model correlating cooling demand to outdoor air temperature inherently included internal loads, equipment schedules, and solar heat gain during the lengthy metering period.
	CPUC Staff Recommendation: See the Summary of ED-Requested Action by the IOU section for relevant requests regarding post-installation savings assumption true-up.
Calculation Methods/Tool review	IOU Proposal: Uses a spreadsheet hourly load model tool developed by AESC and adjusted using pre/post meter data and regression models from the ET Report. The data used are from a "Div1" and "superstore" site, both located in climate zone 12, and both are of the same retail chain as the stores in this project. The AESC-developed load model tool was specifically developed for this Dual Cool evaporative cooling technology.
	CPUC Staff Assessment: The calculation method and tool used for this project's savings estimates are appropriate. Further adjustments could have been made to the tool after the "phase 1" post-installation M&V plan was completed. For "phase 2" model adjustments will be required after post-installation M&V is completed on each of the eight stores.
	CPUC Staff Recommendation: See the Summary of ED-Requested Action by the IOU section for relevant requests regarding post-installation savings assumption true-up for the next phase submission, X260A.
Pre- or Post-Installation M&V Plan	IOU Proposal: Pre-installation M&V amounted to equipment verification for three of the twelve sites and collection of equipment specifications for the twelve sites.

Reviewed Parameter	Analysis
	The ET Report also informed baseline energy consumption using regression models that had been calibrated using two weeks of monitored data from a "Div1" and "superstore" site, both in climate zone 12. The post-installation M&V plan for "Phase 1" (4 of the 12 stores, all in CZ12) included site inspection for one of the stores and a requirement for the IOU to submit a copy of the paid invoice for the four stores. Post-installation measurement efforts for this project phase are not planned and will use findings from the previous M&V effort (the ET Report). The "div1" and "superstore" calculation workbooks use 5 months of post-installation monitored data from the retail chain's "Div1" and "superstore" climate zone 12 sites that participated in the ET Report. The post-installation M&V plan for "Phase 2" (8 of the 12 stores in CZ2 and CZ13) which is planned to be completed in 3Q2014 plans to collect the following over a period of 2-4 weeks: (1) Electrical *(All measurements baseline and post-measure)* a. Current, all retrofit AC units (6 AC units). Volts and power factor will be spot checked. (2) HVAC a. Outside air dry bulb temperature and relative humidity (two locations). b. For 6 retrofit rooftop packaged air conditioning units: i. Dry bulb and relative humidity, condenser air evaporative pre-cooling outlet (measured behind condenser coil). ii. Dry bulb temperature and relative humidity, OSA pre-cooling discharge. iii. Dry bulb temperature and relative humidity, return air. iv. Dry bulb temperature and relative humidity, mixed air. v. Dry bulb temperature and relative humidity, supply air. (3) Water a. OSA pre-cooling system water temperature (measured in sump). The field data collected in 2014 will be also corroborated with the M&V efforts performed in 2012 for the CZ12 stores. These data points will be used to verify/modify the compressor load regression model and static input parameter values used in the savings calculation workbooks for stores in CZ2 and CZ13. One "superstore" in CZ2 and one "div1" store in CZ13 will be sampled for monitoring.

Reviewed Parameter	Analysis
	CPUC Staff Assessment: The post-installation M&V plan for the "Phase 2" project is acceptable; however, the phase 2 project application submittal will be required to include the five (5) CPUC staff requested items in order for the ex ante savings to be approved.
	CPUC Staff Recommendation: None
Net-to-Gross Review	IOU Proposal: Not provided
	CPUC Staff Assessment: Not assessed
	CPUC Staff Recommendation: None

Table 1-3 Energy Savings Summary, Project Costs & Incentive

Description	IOU Ex Ante Claim	CPUC Staff Recommendations
First Year kWh Savings	185,100	166,590 (GRR of 0.9 applied)
First Year Peak kW Savings	292	262.8 (GRR of 0.9 applied)
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 (RUL thru EUL Period)	185,100	166,590 (GRR of 0.9 applied)
Peak kW Savings (RUL thru EUL Period)	292	262.8 (GRR of 0.9 applied)
Therms Savings (RUL thru EUL Period)	0	0
Annual Non-IOU Fuel Impact (RUL Period)	N/A	N/A
Annual Non-IOU Fuel Impact (RUL thru EUL Period)	N/A	N/A
Project Costs for Baseline #1 (RUL or EUL)	$171,356.50	$171,356.50
Project Costs for Baseline #2 (EUL minus RUL period)	N/A	N/A
Project Incentive Amount	$56,965	$56,965