

Phase I Ex Ante Review Findings

Table 1-1: Project Information

IOU	Pacific Gas & Electric
Application ID	2K1400007940
Application Date	4/23/2014
Program ID	PGE21011 - Calculated Incentives
Program Name	Commercial Calculated Incentives
Program Year	2014
Itron Project ID	X516
IOU Ex Ante Savings Date	7/25/2014
Measure Name	Static switch installation
Project Description	This project adds new load switching technology to two existing 500 kW uninterruptible power supplies. The switches raise the systems operating efficiencies to approximately 99% from their assumed baseline efficiencies of ~93%. The estimated energy savings are 269,743kWh/yr and 31Peak-Period kW.
Date of CPUC Staff Review(s)	08/26/2014
Primary Reviewer / Firm	John Hill / J. J. Hirsch & Associates
Review Supervisor / Firm	Nikhil Gandhi / Strategic Energy Technologies, Inc.
CPUC Staff Project Manager	██████████ / 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	CPUC Staff waives further review of the project and recommends that PG&E apply a GRR of 0.9 to estimated savings after post-installation true-up. Since the customer estimated the EUL of the UPS system as 15 years, the remaining useful life is of the existing UPS system is three years. Per the EUL-RUL guidance document, the EUL of add-on equipment must be capped at the RUL of the equipment it is added on to. Staff recommends that PG&E claim only a three-

	<p>year EUL for the proposed static switch. If PG&E would like to claim full EUL of the static switch, it should obtain a written commitment from the customer that the static switch will remain in place when the existing UPS system is replaced. Further evidence should be maintained in the project files to demonstrate that the static switch is compatible with all baseline models of the UPS system.</p>
--	---

Measure Description

The project measure is to add static switches to two existing 500 kW uninterruptible power systems (UPS). The existing Eaton model #9395-500 systems are double conversion types in which power is fed to the dc battery system, which in turn feeds an inverter that meets the system load. The measure seeks to retrofit this system by adding a rapid static switch to the system. This system allows the UPS to be by-passed during normal operation, switching to the battery only with a power loss or disturbance. The by-pass feature raises the effective efficiency of the UPS to an estimated 99% from its existing efficiency of ~90%.

Summary of Review

The Investor-Owned-Utility (IOU) submitted numerous documents for this Phase I review. Documents providing the bulk of information used in this review are as follows:

- Project Description file *2K1400007940ProjectDescription.pdf*;
- Measurement and verification plan *M&V Plans.docx*;
- Measure savings calculation spreadsheet *2K1400007940-COM PA Approved XXX UPS upgrade calculations.xlsx*;
- Project cost quote document *Project Cost information XXX ESS 8-21-13.doc* ;
- Electronic information from the owner on system age and EUL, *2K1400007910-COM - EUL and CRAC size.msg*; and
- Baseline document for data centers, *Energy Efficiency Baselines for Data Centers, March 2013*.

The proposed measure is to upgrade existing UPSs with an Energy Saver System (ESS). This add-on system allows the existing double conversion UPS system to operate under by-pass unless there is a disturbance in the utility power. The ability to by-pass the existing double conversion mode increases the operating efficiency of the UPSs to a claimed level of 99%.

Data were collected via the existing UPSs to establish system load and operating efficiency. Both power input and power output values are provided by the UPSs system readouts. Two sets of power output values were provided in documents provided. The project description file provided load readings of 246.2 kW for UPS 14-A and 268.3 kW for UPS 14-B. A later set of load readings were 221.8 kW and 213.2 kW for the A and B inverters respectively. The later, lower output values were used in ex-ante calculations. Input power reading taken at the same time as the lower output readings were 245.9 kW and 236.7 kW for the A and B UPSs. These readings indicate a 90% current operating efficiency. Additionally, the both units are rated at an output of 500 kW. For the second, lower power output readings, unit loading is 44.4% for UPS 14-A and 42.6% for UPS 14-B.

The UPSs were installed in 2002 and the owner's general policy is that these systems would have a EUL of 15 years. While the measure is an add-on retrofit, the age of the units and their proximity to their end of life appears to have led PG&E to assume a baseline efficiency of a standard replacement unit as provided in March 2013 Energy Efficiency Baselines for Data Centers. Using the formula for baseline inverter efficiency based on inverter loading from this document, baseline inverter efficiencies for the purpose of ex-ante calculations were 92.6% for UPS 14-A and 92.4% for UPS 14-B. Ex-ante energy and demand savings were calculated on the assumed loading of 221.8 kW and 213.2 kW for UPS 14-A and UPS 14-B respectively. Savings are associated with the difference in the UPS measure efficiency of 99% to baseline values of 92.6% and 92.4%. The systems operate continuously – 8,760 hours per year. The resulting ex-ante estimates are 269,743 kWh/year and 31 kW. The uncapped incentive is \$24,659.44. The project cost estimate is \$33,139. With a 50% of project cost limit, the capped incentive is \$16,569.50.

Review Conclusion

The CPUC review staff agrees with PG&E's assessment that the measure is eligible as an add-on retrofit.

Summary of CPUC Staff Requested Action by the IOU

CPUC Staff waives further review of the project and recommends that PG&E apply a GRR of 0.9 to estimated savings after post-installation true-up. Since the customer estimated the EUL of the UPS system as 15 years, the remaining useful life of the existing UPS system is three years. Per the EUL-RUL guidance document, the EUL of add-on equipment must be capped at the RUL of the equipment it is added on to. Staff recommends that PG&E claim only a three-year EUL for the proposed static switch. If PG&E would like to claim full EUL of the static switch, it should obtain a written commitment from the customer that the static switch will remain in place when the existing UPS system is replaced. Further evidence should be maintained in the project files to demonstrate that the static switch is compatible with all baseline models of the UPS system.

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
	CPUC Staff Assessment: Add-on Measure
	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: Industry standard practice via the 2013 data center baseline study.
	CPUC Staff Assessment: Industry standard practice via the 2013 data center baseline study.
	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 of measure
	CPUC Staff Assessment: Full cost of measure
	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:
EUL (for each measure)	IOU Proposal: None
	CPUC Staff Assessment: The EUL of the measure should be capped at the RUL of the equipment on which the measure is to be added.
	CPUC Staff Recommendation: Claim a three-year EUL for the measure. Or, obtain and maintain written evidence that the measure will remain in place when the existing UPS system is replaced and that the measure is compatible with available baseline UPS systems.
Savings Assumptions	IOU Proposal: Savings are proportional to the improved UPS efficiency based on current UPS loading.
	CPUC Staff Assessment: Approach is appropriate, with input assumptions documented.
	CPUC Staff Recommendation: none

Reviewed Parameter	Analysis
Calculation Methods/Tool review	IOU Proposal: Direct calculation via a live calculation spreadsheet.
	CPUC Staff Assessment: Calculation method is appropriate and adequately documented.
	CPUC Staff Recommendation: none
Pre- or Post-Installation M&V Plan	IOU Proposal: Combination of Option A and Option C approaches. Spot measurements of input power and output power to be taken with and without the Static Switch activated. Power to be taken over half-hour periods associated with each operating condition. Additionally, utility billing meter is to be reviewed over the same time period to identify energy and demand impacts.
	CPUC Staff Assessment: Approach is adequate
	CPUC Staff Recommendation: None
Net-to-Gross Review	IOU Proposal: non
	CPUC Staff Assessment: None requested
	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	269,743 kWh	TBD
First Year Peak kW Savings	31 kW	TBD
First Year Therms Savings	N/A	N/A
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)	N/A	N/A
Peak kW Savings (RUL thru EUL Period)	N/A	N/A
Therms Savings (RUL thru EUL Period)	N/A	N/A
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)	Total Project Cost \$33,139	TBD
Project Costs for Baseline #2 (EUL minus RUL period)	N/A	N/A
Project Incentive Amount	\$16,569.50	TBD