

Phase I Ex Ante Review Findings

Table 1-1: Project Information

IOU	Pacific Gas and Electric (PG&E)
Application ID	REEP 108
Application Date	12/09/2013
Program ID	PGE21029
Program Name	Refinery Energy Efficiency Program
Program Year	2013
Itron Project ID	X484
IOU Ex Ante Savings Date	12/09/2013
Measure Name	Hydrogen System Controls Upgrade
Project Description	Reclaim vented process hydrogen as refinery boiler fuel
Date of CPUC Staff Review(s)	03/18/2014
Primary Reviewer / Firm	John Hill, Nikhil Gandhi/ CPUC Consultants
Review Supervisor / Firm	Nikhil Gandhi, CPUC Consultant
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	Data is requested to confirm ex-ante estimates, assure adequacy of the M&V effort and establish project EUL. This project's ex ante savings are not approved.

Measure Description

The following measure reclaims excess hydrogen produced by the refinery as fuel gas, offsetting the need for purchased natural gas. Hydrogen is a by-product of the refinery process. Much is recycled back into the process, but more hydrogen is available than is needed by the process. This excess hydrogen is currently being vented to atmosphere. There are two venting systems; a smaller system that vents normal hydrogen over-production and a large system that vents hydrogen produced by a plant upset. Only the smaller venting system is addressed in this measure as a means to limit the rate of hydrogen added to the fuel stream.

Hydrogen venting is monitored. The average vent rate over the 14 month period from October, 2012 through mid-December, 2013 was approximately 4.1 million cubic feet per day. Redirection of this gas to the refinery fuel gas system at this rate is expected to reduce the annual purchase of natural gas by over 4,000,000 therms annually.

The anticipated project to implement the measure is \$300,000. The potential savings allows for an IOU-sponsored incentive of \$150,000, or half the project cost.

Summary of Review

The Investor-Owned-Utility (IOU) submitted the following documents for this Phase I review:

- REEP 108 PPA - P66 H2 System Controls Upgrade_v2.doc – project description document;
- REEP 108 PPA Title Page_v2.doc - summary title page of project description;
- REEP 108 PPA - P66 H2 System Controls Upgrade_v2.xlsx – ex-ante estimation workbook;
- Hydrogen Vent Project.msg – e-mail from project engineer outlining importance of incentives and lack of environmental regulation on hydrogen venting; and
- Approved REEP- 108 PPA report [REDACTED] 66 H2 System Upgrade Project .msg – PG&E internal project review and approval notification.

The CPUC review staff accepts the potential feasibility and ex-ante calculation approach. It is accepted at this time that reclaiming vented excess hydrogen is eligible to be evaluated as an add-on measure.

The savings calculation method is reasonable as the energy content of the recovered vent output is known within reason. The only items in question at this time are the quantity of vented hydrogen to be used in ex-ante calculations and confirmation that purchased natural gas exceeds the energy content of the vented hydrogen.

The vented hydrogen to be recovered is monitored at the refinery, with ex-ante savings estimate based on average hydrogen vent rates from October, 2012 through mid-December, 2013. The data provided has shown a significant reduction in vented hydrogen starting around August 2013

to the point that a year-over-year comparison of October through December vent rates shows a 46% decline. The project report does not provide any comment on the declining hydrogen vent rate. Information needs to be provided that explains the change in hydrogen vent rates and supports the average over 14 months of data that includes earlier time periods that do not appear to be consistent with more current time periods. Specifically, we request the following:

- Additional data on the venting rate of the 2” hydrogen line for the past five years.
- Please disclose whether any hydrogen line balancing modifications were done during the last year at this location.
- Please provide the most recent Flare Management Plan for the site.
- Monthly purchased natural gas summaries to confirm that the energy offset is within actual purchased levels.

The measure proposes to reclaim all hydrogen as a purchased fuel offset. The M&V plan is based upon this assumption, with a plan limited to a month’s summary of the rate of hydrogen passing through the associated vent. The M&V plan is inadequate at this point, and should address the additional information:

1. The plan will need to confirm that the eventual installed hardware does have venting capabilities downstream of the existing hydrogen vent metering station, and if it does, the M&V plan should include a utility grade meter on the line immediately prior to the connection with the existing fuel line to the plant.
2. The duration of the data collection process used in the M&V effort may need to be expanded if current variations in the small line hydrogen vent cannot be identified and normalized for the first year of operation.

The project proposal provides no equipment life estimates.

There is no reason to question the project cost estimate, as costs are well within that supported by potential reductions in purchased natural gas.

Review Conclusion

While this review does not dispute the appropriateness of the measure or the overall ex-ante calculation approach, ex-ante savings are not approved at this time until proposal details are resolved. These requested details are noted as action items listed below.

Summary of CPUC Staff Requested Action by the IOU

CPUC Staff requests that the IOU undertake the recommended steps and submit the following information due on **04/08/2014** (or 14 days from submittal date to IOU):

1. Expand the data set on the 2” hydrogen vent line to 5 years.
2. Provide an explanation for the declined small line hydrogen vent rate as illustrated in Figure 5 of the project report. The average hydrogen vent rate dropped from 4.8 million cubic feet per day in October through December, 2012 to 2.7 million cubic feet per day from October through mid-December, 2013. Provide a reasonable explanation why the 4.1 million cubic feet per day used in ex-ante saving will be realized, on average, after the installation of the measure.
3. Site data is to be provided on any hydrogen line rebalancing within the past year and the sites Flare Management Plan.
4. Provide monthly purchased natural gas summaries for the past calendar year.
5. As part of the M&V effort, provide confirmation that there will be no mechanism for hydrogen venting downstream of the vent metering station after the installation of the measure. If this cannot be confirmed, then the M&V plan is to be expanded to include a utility grade meter on the 2” vent line immediately prior to the connection with the plant’s fuel line.
6. Provide an expanded M&V plan that accounts for the variation in hydrogen vented through the small line as noted in Figure 5 of the proposal. This can include an expanded M&V period if necessary, or some other analytical method to allow extrapolation of a shorter to typical annual vent rates.
7. Provide equipment life estimates.

Table 1-2 Review Findings

Reviewed Parameter	Analysis
<p>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)</p>	IOU Proposal: Not explicitly stated
	CPUC Staff Assessment: Add-on Measure
	CPUC Staff Recommendation: Add-on measure
<p>Project Baseline Technology (in situ equipment, Title 24 (specify year), other code or other efficiency level (specify), industry standard practice - ISP)</p>	IOU Proposal: Existing Condition – hydrogen is vented
	CPUC Staff Assessment: Existing condition is accepted for the baseline type as add-on.
	CPUC Staff Recommendation: none
<p>Project Cost Basis (Full Incremental, or Both. Note: For early retirement projects, include RUL through EUL cost basis treatment)</p>	IOU Proposal: Full cost
	CPUC Staff Assessment: Full cost
	CPUC Staff Recommendation:
<p>RUL (required for early retirement projects only, otherwise N/A)</p>	IOU Proposal: N/A
	CPUC Staff Assessment: Not applicable
	CPUC Staff Recommendation: None
<p>EUL (for each measure)</p>	IOU Proposal: Not provided
	CPUC Staff Assessment: TBD
	CPUC Staff Recommendation:
<p>Savings Assumptions</p>	IOU Proposal: The energy content of the reclaimed hydrogen provides a direct offset to purchased natural gas. The daily vent rate is monitored at the plant and used to determine the potential reclaimed energy content. Daily monitored data are pro-rated to 8,628 annual plant operating hours.
	CPUC Staff Assessment: Concept is appropriate, but additional confirmation on the correct vent quantities and quantities of purchased natural gas have been requested. While the correction is small, pro-rating the data to 8,628 plant operating hours in the ex-ante assessment is not really required since any plant down-time would be reflected in daily vent rates.

Phase I Ex Ante Review Findings

Reviewed Parameter	Analysis
	CPUC Staff Recommendation: Evaluate once requested materials are in hand.
Calculation Methods/Tool review	IOU Proposal: Spreadsheet analysis based on monitored hydrogen vent rates and the energy content of the hydrogen stream (99.9% hydrogen and 0.1% methane). The energy content converted to therms provides the purchased natural gas offset.
	CPUC Staff Assessment: Calculation method is reasonable.
	CPUC Staff Recommendation: none
Pre- or Post-Installation M&V Plan	IOU Proposal: Collect one month of small line vent rates monitored at the refinery after installation of the reclaim system.
	CPUC Staff Assessment: The M&V plan may not be of sufficient duration depending on the explanation of year-over-year changes in vent rates noted in the plant data. Additionally, post inspection of the reclaim system must confirm that no atmospheric venting is possible.
	CPUC Staff Recommendation: To be decided upon receipt of requested materials.
Net-to-Gross Review	IOU Proposal: Not provided
	CPUC Staff Assessment: Not assessed
	CPUC Staff Recommendation: TBD

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

Description	IOU Ex Ante Claim	CPUC Staff Recommendations
First Year kWh Savings	N/A	N/A
First Year Peak kW Savings	N/A	N/A
First Year Therms Savings	4,042,723	TBD
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)		
Annual Non-IOU Fuel Impact (RUL thru EUL Period)		
Project Costs for Baseline #1 (RUL or EUL)	Total Project Cost \$300,000	\$300,000
Project Costs for Baseline #2 (EUL minus RUL period)	Incremental Project Cost \$300,000	\$300,000
Project Incentive Amount	\$150,000	\$150,000 Incentive capped at 50% of the full project cost.