

Phase II Final Ex Ante Review Findings - [Electric](#)

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

IOU	PG&E
CMPA Sample Date	2/19/2013
Application ID	2K13145622
Application Date	1/16/2013
Program ID	PGE21021
Program Name	Commercial Calculated Incentives
Program Year	2013
Itron Project ID	X311 (related to X044 for SCG)
IOU Ex Ante Savings Date	1/16/2013
CPUC Staff Measure Name	HE Broiler Retrofit
Project Description	Retrofit existing broilers with new energy efficient conveyor broilers
Date of CPUC Staff Review	3/1/2013, 12/20/2013
Primary Reviewer / Firm	Betsy Ricker, Paolo Pecora / ERS
Review Supervisor / Firm	Joseph Ball / Itron
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	Project electrical energy savings are approved on 12/31/2013— based on post-install M&V of eight (8) sites— at the following levels: 7,809 kWh and 1.12 kW peak demand reduction.

Measure Description

This measure is to replace existing broilers (Nieco 1424) with more energy efficiency broilers (Nieco JF143). This fast food preparation facility uses conveyor broilers to prepare the food products in large quantity. Typical conveyor broilers cook food products through radiant heating and toast buns on a second conveyor with separate 3 kW electronically-heated platens. The proposed broiler, the Nieco JF143, operates in a similar fashion. It, however, cooks food with both radiation and convection, allowing the maximum energy input for the burners to be reduced from ~100,000 Btu/hour to ~55,000 Btu/hour. Because of the relative placement of the burners and second conveyor for the buns, the recycle heat also warms the toasting platen, eliminating the need for additional electric resistance heat for toasting. The newly designed broiler has a lower profile and uses the convective heat to more efficiently cook the food. Even though the overall electrical consumption decreases there is an added electrically powered fan. Due to the requirements of some regional air quality management districts (AQMDs), conveyor broilers in some regions of California are required to be outfitted with a catalytic converter. Testing by the Food Service Technology Center has shown that installing a catalyst on a conveyor broiler can actually reduce the broiler's natural gas consumption by reflecting more heat back into the broiler. Only those Neico 1424 broilers located in AQMDs that require catalysts are outfitted with these converters. All of the proposed JF143 broilers will be outfitted with a catalyst, regardless of the restaurant's AQMD.

The measure included in this project is to retrofit in-situ Nieco 1424 broilers with a new energy efficient Nieco broiler (JF143). Installing a more efficient appliance provides significant natural gas savings as the conveyor broilers are among the most energy intensive appliances in their kitchen. Electric savings are also achieved through the removal of the 3 kW bun toasting element and opening of the bun conveyor oven compartment to allow broiler heat to warm the buns without any additional convective fan energy. The customer is installing this new broiler in approximately 50 locations in PG&E's service territory.

Summary of Reviews

Submittal Package Data Summary

This is a statewide disposition based on documents provided for CPUC staff review that included the following: Project application, SCG's Broiler replacement workpaper, updated DEER net to gross values, broiler testing final report, and E3 cost calculation spreadsheet.

Food Service Technology Center (FSTC) Meeting

Staff consultants also performed a site visit to the Food Service Technology Center (FSTC) on November 1st, 2012 to discuss the project with the customer, the FSTC staff, and IOU (both SCG & PG&E) representatives.

At the time of this visit, CPUC staff visited a nearby franchised restaurant to see what type of space would be available for conducting short term measurements and energy monitoring. The broiler cooking temperature was set to maximum setpoint, and the manager said that cooking times in the 22-year old broiler have increased to about three minutes due to degradation of the unit. ED noted that there is plenty of space beneath the broiler to contain a high-accuracy gas meter. The natural gas fuel line disconnect was within two feet for relatively easy installation.

Baseline

During discussions with SCG (not PG&E) and the customer about early versus normal replacement claims and additional data required for early replacement, the IOU and customer decided that a normal replacement claim would suffice for all applications.

Project Costs

Invoices provided by SCG indicated the following installed costs with and without a catalytic converter.

Installed Cost of Broiler	With Catalytic Converter	Without Catalytic Converter
Chainbroiler	\$6,250	\$6,250
Stand	\$490	\$490
Catalytic Converter	\$1,558	\$0
Equipment Cost	\$8,298	\$6,740
Freight	\$688	\$596
Sales Tax	\$602	\$602
Total	\$9,588	\$7,937

CPUC staff assumes these costs were for the baseline model 1424 broiler.

Equipment Operation & Production

The customer contact indicated that [REDACTED] of their restaurants in California are corporate-owned and [REDACTED] are franchises. The contact also indicated that the hours of operation vary, but conservatively estimated that, on average, each location's broiler operates for 18 hours per day 364 days each year, with one preheat per day. Also, each location cooks approximately 355 pounds of product per day on the broiler on average. Four main proteins are cooked on the broiler (hamburgers, chicken, turkey burgers, and steak). For the pre-existing broiler, the buns were warmed separately on a lower conveyor using a 3 kW heating element. The new broiler has a similar conveyor as the old one; however, it also now has an open area at the bottom of portion to allow broiler heat to enter the bun warmer chamber to heat the buns, in lieu of an electric heating element (that was part of the old broiler).

The broiler mean radiant temperature (ranging from 900-950 F) and conveyor speeds do not vary within a particular restaurant. This latter point has a strong impact on the energy savings associated with this measure. The broiler is operated such that the unit is turned on in the morning and runs all day. When the unit is turned on the gas valve is opened, the burner ignites, and the unit remains running throughout the day. The volume of gas used is therefore independent of the weight of product being cooked, but dependent on the runtime of the broiler. According to the customer contact the broiler settings do not vary across corporate locations; however, the franchise-operated restaurants will have greater variation in broiler temperature set points as well as operating hours due to greater differences between owners, managers, and operators. At the corporate-owned locations the protein products require typically 2 to 2.5 minutes cooking time on the conveyor broiler.

Electric Savings Verification

The IOUs provided pre-implementation electric amperage data for 16 corporate sites (note: PG&E comprised 14 of the 16 sites while SDG&E provided 2 electrical pre-M&V sites) and post-implementation amperage data for 8 matching PG&E sites. Compared to the FSTC baseline test results, the in situ degraded broilers represented, on average, a 12.2% increase in weekday energy consumption over the non-degraded 1424 broilers.

CPUC staff observed that the eight post-M&V sites were biased to represent locations with longer operating hours, which representing a 32% increase in kWh savings over FSTC test results; therefore, CPUC staff adjusted the hours using weighted averages and included the all 16 pre-install sites, and determined the average electric energy savings and peak kW reduction at these sites. These were compared to the annual savings estimated by the FSTC. The annual energy savings and demand reduction were based on the measured data and represented an average increase of 9.5% in kWh savings and average increase of 3.1% in peak demand reduction estimate as compared to the FSTC-estimated savings.

Review Conclusion

Project electrical energy savings are approved on December 31, 2013 — based on post-install M&V of eight (8) sites — at the following levels: 7,809 kWh and 1.12 kW peak demand reduction.

Summary of CPUC Staff Requested Action by the IOU

The IOU is requested to perform the following actions *to complete between date of this review findings document and February 2014 when the gas portion of the M&V analysis will be concluded.* :

1. Obtain explanation from Fishel-Nickel as to why their measured baseline Nioco 1424 broiler idle electricity rate of 1.55 kW is greater than the production (cooking) electricity rate of 1.35 kW (from their 2011 Broiler Testing Report).
2. PG&E still needs to provide incremental project costs in the form of an itemized paid invoice broken down by material, labor and shipping.
3. Also the data from all six (6) Sempra utility natural gas M&V points are expected to be submitted in early February 2014. Therefore, PG&E will have to await those results before natural gas savings and incentives can be finalized for this portion of the project.

Interactive Cooling Effects

Staff noted that there are likely interactive cooling (and possibly minor heating) impacts for this measure, as the proposed broiler has less heat loss into the kitchen, potentially reducing the HVAC cooling load and increasing any space heating loads. Hence, interactive effects and energy savings should be estimated by IOU.

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>	<p>IOU Proposal: Normal Replacement</p> <p>CPUC Staff Assessment: Accept</p> <p>CPUC Staff Recommendation: None</p>
<p>Project Baseline Technology (in situ equipment, Title 24 (specify year), other code or other efficiency level (specify), industry standard practice - ISP)</p>	<p>IOU Proposal: A new non-degraded in situ Nieco 1424 broiler</p> <p>CPUC Staff Assessment: For normal replacement a brand new (non-degraded) Nieco 1424 broiler is the appropriate baseline using the FSTC testing results.</p> <p>CPUC Staff Recommendation: None</p>
<p>Project Cost Basis (Full Incremental, or Both. Note: For early retirement projects, include RUL through EUL cost basis treatment)</p>	<p>IOU Proposal: Assumed to be full cost. Invoices provided by the IOU indicated a typical full broiler cost of \$9,500 and \$7,900 with and without a catalytic converter. The cost varied somewhat due to differences in shipping costs between locations.</p> <p>CPUC Staff Assessment: For the normal replacement baseline, incremental costs apply. During CPUC staff's meeting at the FSTC an incremental cost of \$5,000 was quoted, but no substantiating information was provided to support this.</p> <p>CPUC Staff Recommendation: Incremental costs apply. Provide itemized invoices broken out to substantiate the first cost of the proposed model J143 broilers and the RUL through EUL baseline broiler and incremental cost.</p>
<p>RUL (required for early retirement projects only, otherwise N/A)</p>	<p>IOU Proposal: N/A</p> <p>CPUC Staff Assessment: N/A</p> <p>CPUC Staff Recommendation: N/A</p>
<p>EUL (for each measure)</p>	<p>IOU Proposal: 12 years (based on 2008 DEER estimates for food service equipment)</p> <p>CPUC Staff Assessment: 12 years accepted</p> <p>CPUC Staff Recommendation: None</p>
<p>Savings Assumptions</p>	<p>IOU Proposal: Calculations were performed that applied the following</p>

Reviewed Parameter	Analysis																																								
	<p>assumptions:</p> <ul style="list-style-type: none"> - 364 days per year of operation - 18 hrs per day of runtime - 355 lbs/day of food cooked - 1 preheat per day <p>All other assumptions were taken from the FSTC testing that was performed on the in-situ and proposed broiler. The table below summarizes the key outputs from the testing performed on these broilers.</p> <table border="1" data-bbox="537 636 1438 789"> <thead> <tr> <th colspan="2">Broiler Type</th> <th>Preheat time (min)</th> <th>Preheat gas (Btu)</th> <th>Preheat electricity (kWh)</th> <th>Idle gas (Btu)</th> <th>Idle electricity (kWh)</th> <th>Full load gas (Btu)</th> <th>Full load electricity (kWh)</th> <th>lb/h of burger</th> </tr> </thead> <tbody> <tr> <td>In-situ</td> <td>1424 no catalyst</td> <td>8.4</td> <td>14130</td> <td>0.45</td> <td>81,970</td> <td>1.55</td> <td>78,560</td> <td>1.35</td> <td>47.6</td> </tr> <tr> <td>In-situ</td> <td>1424 w/catalyst</td> <td>8.4</td> <td>14130</td> <td>0.45</td> <td>78,120</td> <td>1.55</td> <td>78,240</td> <td>1.35</td> <td>41.7</td> </tr> <tr> <td>Proposed</td> <td>F143</td> <td>46.2</td> <td>14210</td> <td>0.62</td> <td>47,960</td> <td>0.37</td> <td>50,940</td> <td>0.33</td> <td>41.7</td> </tr> </tbody> </table> <p>CPUC Staff Assessment: M&V metered data for both pre- and post-retrofit conditions were analyzed by CPUC staff. Pre-meter data was used to substantiate the FSTC test results as appropriate baseline energy saving values. With 90% confidence and 5% precision that FSTC underestimated the weekday natural gas usage by 3.9% and electricity usage by 12.2%. From the 2011 FSTC Testing Report CPUC staff is unclear as why the idle electric demand of 1.55 kW is greater than the production electric demand of 1.35 kW.</p> <p>CPUC Staff Recommendation: Please explain why the idle electric demand of 1.55 kW is greater than the production electric demand of 1.35 kW.</p>	Broiler Type		Preheat time (min)	Preheat gas (Btu)	Preheat electricity (kWh)	Idle gas (Btu)	Idle electricity (kWh)	Full load gas (Btu)	Full load electricity (kWh)	lb/h of burger	In-situ	1424 no catalyst	8.4	14130	0.45	81,970	1.55	78,560	1.35	47.6	In-situ	1424 w/catalyst	8.4	14130	0.45	78,120	1.55	78,240	1.35	41.7	Proposed	F143	46.2	14210	0.62	47,960	0.37	50,940	0.33	41.7
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Calculation Methods/Tool review	<p>IOU Proposal: Spreadsheet calculations were performed based on the assumptions noted above.</p> <p>CPUC Staff Assessment: CPUC staff was able to replicate the applicant savings in Excel by applying the assumptions noted above.</p> <p>CPUC Staff Recommendation: None</p>																																								
Pre- or Post-Installation M&V Plan	<p>IOU Proposal: M&V not proposed</p> <p>CPUC Staff Assessment: CPUC staff requested both pre- and post-install M&V be performed by three IOUs on a sample of sites (both electric and natural gas) in their respective service territories: The following sampling was recommended & conducted:</p> <table border="1" data-bbox="537 1675 1393 1864"> <thead> <tr> <th>IOU</th> <th>CPUC Pre-M&V Request</th> <th>IOU Pre-M&V Completed</th> <th>CPUC Post-M&V Request</th> <th>IOU Post-M&V Completed</th> </tr> </thead> <tbody> <tr> <td>PG&E</td> <td>8 gas</td> <td>8 gas 14 elec</td> <td>2 gas 8 elec</td> <td>2 gas 8 elec</td> </tr> </tbody> </table>	IOU	CPUC Pre-M&V Request	IOU Pre-M&V Completed	CPUC Post-M&V Request	IOU Post-M&V Completed	PG&E	8 gas	8 gas 14 elec	2 gas 8 elec	2 gas 8 elec																														
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Reviewed Parameter	Analysis				
	SCG	5 gas	4 gas	4 gas	4 gas
	SDG&E	2 gas	2 gas 2 elec	2 gas	2 gas
	SCE	N/A	TBD	N/A	TBD elec
	<p>After the post-M&V was completed CPUC statistical analysts determined that based on the pre-data analysis to maintain proper precision only 8 gas and 8 electric post-retrofit M&V ample points would be needed. Additionally, CPUC staff will be requesting M&V data from SCE which may augment final electric savings values.</p>				
CPUC Staff Recommendation: None					
Net-to-Gross Review	IOU Proposal: 0.7 (default for non-residential measures from DEER)				
	CPUC Staff Assessment: Net to gross interview was completed and a NTG ratio of 0.55 was calculated.				
	CPUC Staff Recommendation: NTGR = 0.55				

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

Description	IOU Ex Ante Claim	CPUC Staff Recommendations
First Year kWh Savings	7,131/location	7,809/location; however, CPUC staff is requesting post-install M&V data from SCE which will be used to corroborate this value. This value may be augmented based on those results. IE effects estimates have not been estimated, and may result in additional kWh savings.
First Year Peak kW Savings	1.09/location	1.12/location; however, CPUC staff is requesting post-install M&V data from SCE which will be used to corroborate this value. This value may be augmented based on those results. IE effects estimates have not been estimated, and may result in additional peak kW reduction.
First Year Therms Savings	1,892 /location	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)	7,131/location	7,809/location; however, CPUC staff is requesting post-install M&V data from SCE which will be used to corroborate this value. This value may be augmented based on those results. IE effects estimates have not been estimated, and may result in additional kWh savings.
Peak kW Savings (RUL thru EUL Period)	1.09/location	1.12/location; however, CPUC staff is requesting post-install M&V data from SCE which will be used to

Description	IOU Ex Ante Claim	CPUC Staff Recommendations
		corroborate this value. This value may be augmented based on those results. IE effects estimates have not been estimated, and may result in additional peak kW reduction.
Therms Savings (RUL thru EUL Period)	1,892 /location	TBD
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)	N/A	N/A
Project Costs for Baseline #2 (EUL minus RUL period)	1424 Broiler w/ Catalytic Converter = \$9,588; w/o Catalytic Converter = \$7,937; Proposed JF143 Broiler pricing not provided.	TBD; based on incremental costs of proposed JF143 broiler. Copies of itemized invoices are required.
Project Incentive Amount	\$1,892.00 (Gas) /location \$750.79 (Elec) /location \$2,642.79 (Total) /location	TBD (Gas) \$815.21 (Elec) /location TBD (Total)