URS

Memorandum

Date: September 13, 2010

To: Homero Rodriguez and Leonard Scandura, SJVAPCD
CC: Gregory Skannal, HECA
Dale Shileikis, URS
Mike Carroll, Latham & Watkins

From: Julie Mitchell, URS

Subject: **HECA Project Planned Rectisol Flare Usage and Maximum Design Capacity for Each Flare**

As a follow-up to our previous discussions, this memo presents the maximum planned Rectisol flare usage for the HECA Project. The emissions from the addition of this planned flaring were modeled and determined to not result in any significant air quality impacts. This memo also outlines the maximum design capacity of each flare for the HECA Project.

Planned Rectisol Flare Usage

The Rectisol flare may be used for off-specification carbon dioxide (CO_2) during gasifier start-up or shut-down events. It is expected that a maximum of 40 hours per year of flaring for this purpose would be required by this flare. The flare would operate for a maximum of 8 hours at any given time, but much shorter durations are expected. The maximum emissions from this planned use of the Rectisol flare were estimated and added to the emissions from continual use of the pilot to obtain total annual Rectisol flare emissions, as presented in Table 1. The emission calculations and the assumptions used to calculate these emissions are presented in Attachment A to this memo.

Table 1
Total Annual Rectisol Flare Emissions

Pollutant	Emissions (tons/year)		
	Pilot	Start-Up/ Shut-Down	Total
NOx	0.158	1.032	1.19
CO	0.105	0.688	0.79
VOC	0.002	0.0112	0.01
SO_2	0.003	0.300	0.30
PM_{10} = $PM_{2.5}$	0.004	0.0258	0.03

New modeling was conducted using the maximum normal operations modeling analysis that had been previously conducted with the addition of the emissions from the newly planned Rectisol flaring. Emission rates for each averaging time are included in Attachment A. The stack parameters used in the AERMOD model for the flare are based on the heating rate and actual stack height. The effective stack height and diameter were estimated using the calculations outlined in Attachment B.

The flare stack parameters for the gasifier and SRU flares are also presented in Attachment B. These were re-evaluated to ensure the most recent data were used as the basis of determining these stack parameters. The stack parameters vary from those provided in the modeling files due primarily to the increased heat rate at the gasifier flare for flaring during a CTG wash.

The model results are presented in Table 2. The concentrations predicted are very similar to those predicted by SJVAPCD without the planned Rectisol flaring and predicted by HECA and presented in HECA's response to CEC Workshop Request 40, June 2010. Table 2 shows that the modeled impacts due to the Project emissions, in combination with conservative background concentrations, will not cause a violation of any Ambient Air Quality Standard (AAQS) and will not significantly contribute to the existing violations of the federal and state PM_{10} and $PM_{2.5}$ standards. These are the same conclusions as presented in previous analyses.

Table 2
AERMOD Modeling Results for Project Operations (All Project Sources Combined)

Pollutant	Averaging Period	Model Predicted Concentration ($\mu g/m^3$)	Class II Significance Level ($\mu g/m^3$)	% of SIL (%)	Background Concentration[3] ($\mu g/m^3$)	Monitoring Station Description[3]	CAAQS ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)
NO_2 [1]	1-hour (OLM) [1,2]	**132.69**	NA	NA	143.4	a	339	NA	276
	Annual (OLM) [1]	**0.66**	1	87%	39.6	a	57	100	40
CO	1-hour [2]	**2,075.51**	2,000	71%	4,025	a	23,000	40,000	6,101
	8-hour [2]	**574.95**	500	43%	2,444	a	10,000	10,000	3,019
SO_2	1-hour [2]	**25.27**	NA	NA	33.8	b	655	NA	59
	3-hour [2]	**16.36**	25	31%	26	b	NA	1,300	42
	24-hour [2]	**1.63**	5	18%	11.7	b	105	365	13
	Annual	**0.13**	1	14%	4.28	b	NA	80	4
PM_{10}	24-hour [2]	**4.08**	5	58%	267.4	a	50	150	-
	Annual	**0.57**	1	59%	56.5	a	20	Revoked	-
$PM_{2.5}$	24-hour [2]	**2.63**	-	44%	154	a	NA	35	-
	Annual	**0.41**	-	45%	25.2	a	12	15	-

Source: HECA Project

Notes:

[1] The Ozone Limiting Method (OLM) was applied using hourly O_3 data.
[2] For short-term (1-, 3-, 8-, and 24-hour) modeling, only one emergency generator will be operational at any one time, at most two gasifier heaters are expected to be operational at any one time, and the auxiliary boiler does not operate at the same time as the CTG/HRSG.
[3] Monitoring station for the maximum background concentration is described below:
a) CARB, Maximum of 2006-2008, Bakersfield Golden State Highway
b) CARB, Maximum of 2007-2009, Fresno – 1st Street

CAAQS = California Ambient Air Quality Standards
CARB = California Air Resources Board
CO = carbon monoxide
$\mu g/m^3$ = micrograms per cubic meter
NA = not applicable.
NAAQS = National Ambient Air Quality Standards
NO_2 = nitrogen dioxide
OLM = ozone limiting method
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
PM_{10} = particulate matter less than 10 microns in diameter
SIL = Significant Impact Level
SO_2 = sulfur dioxide

Maximum Design Capacity for Each Flare

The three flares are designed to handle the maximum possible, unplanned emergency upset conditions that could happen at the facility. These unintentional events should not occur, but the flares must be designed to safely dispose of the maximum, worst-case gas stream. The gasification flare is designed to handle the maximum instantaneous syngas production from two gasifiers that could occur due to a downstream failure event (or events). The sulfur recovery unit flare is designed to handle the unlikely case of both Claus trains failing simultaneously. The Rectisol flare is designed to handle total flow from an unlikely equipment failure event, such as a major failure in the acid gas removal (AGR) unit. The duration of these upset events is difficult to predict although HECA will do everything reasonably possible to correct the problem that has caused unplanned flaring in a timely manner and begin actions to minimize emissions and the amount of gas flared. These maximum upset flaring events are outlined below in Table 3.

Table 3
Maximum Design Capacity for Each Flare at HECA

Parameter	Gasification Flare Emergency Syngas Relief	SRU Flare Emergency Acid Gas Relief	Rectisol Flare Emergency Shut-Down Vent
Maximum Heat Rate, 10^6 Btu/hr HHV	2000	1229	430

The events outlined in Table 3 are unplanned upset conditions that are never expected to occur, but the flares are designed to safely dispose of the maximum stream that might occur. Due to the fact these could only occur as an emergency event and would be reported to SJVAPCD as such, HECA does not believe that these events should be modeled and compared to AAQS. These events have been examined to ensure that possible worker exposures to airborne pollutants are below the worker safety limits.

Attachment A
Rectisol Flare Emission Calculations

Hydrogen Energy California LLC
HECA Project

9/9/2010

Rectisol - Normal Operating Emissions from Pilot

Total Hours of Operation	8,760	hr/yr
Rectisol Flare Pilot Firing Rate	0.3	MMBtu/hr

Hours per Qtr Pilot Operation			
Q1	**Q2**	**Q3**	**Q4**
2190	2190	2190	2190

Assuming equal operation in each quarter

Pilot Pollutant Emission Factors

NOx (lb/MMBtu, HHV)	0.12
CO (lb/MMBtu, HHV)	0.08
VOC (lb/MMBtu, HHV)	0.0013
SO_2 (lb/MMBtu, HHV) (12.65 ppm)	0.002
PM_{10} = $PM_{2.5}$ (lb/MMBtu, HHV)	0.003

Pilot Pollutant Emission Rates

Pollutant	**Pilot Emissions lb/hr**	**lb/day**	**lb/yr**	**ton/qtr**	**ton/yr**
NOx	0.036	0.86	315.36	0.04	0.2
CO	0.024	0.58	210.24	0.03	0.1
VOC	0.0004	0.01	3.42	0.0004	0.002
SO_2	0.0006	0.01	5.37	0.0007	0.003
PM_{10} = $PM_{2.5}$	0.0009	0.02	7.88	0.00	0.004

Rectisol Flare - Operating Emissions During Gasifier Startup and Shutdown

Total Hours of Operation	40	hr/yr
Rectisol Flare Power Rate (heat input), HHV	430	MMBtu/hr

Flare Pollutant Emission Factors		Flare operates up to	8	hours at a given time
NOx (lb/MMBtu, HHV)	0.12			
CO (lb/MMBtu, HHV)	0.08			
VOC (lb/MMBtu, HHV)	0.0013			
SO_2 (lb/hr)	15			
PM_{10} = $PM_{2.5}$ (lb/MMBtu, HHV)	0.003			

SO_2 emissions based on 50 ppmv sulfur concentration in the flare gas, with a maximum flare gas flow of 4,542 lbmol/hr.

Flare Pollutant Emission Rates

Pollutant	Emissions lb/hr	lb/day	lb/yr	ton/qtr	ton/yr
NOx	51.60	412.80	2,064.00	0.258	1.032
CO	34.40	275.20	1,376.00	0.172	0.688
VOC	0.56	4.47	22.36	0.003	0.011
SO_2	15.00	120.00	600.00	0.075	0.300
PM_{10} = $PM_{2.5}$	1.29	10.32	51.60	0.006	0.026

Rectisol Flare - Total Annual Emissions

Pollutant	Emissions			
	Pilot (ton/yr)	Start-Up/ Shut-Down (ton/yr)	Total (ton/qtr)	Total (ton/yr)
NOx	0.158	1.032	0.30	1.19
CO	0.105	0.688	0.20	0.79
VOC	0.002	0.0112	0.003	0.01
SO_2	0.003	0.300	0.076	0.30
PM_{10} = $PM_{2.5}$	0.004	0.0258	0.007	0.03

Modeling Worst-Case 1 hr Emissions

NOx (g/sec)	6.506
CO (g/sec)	4.337
SO_2 (g/sec)	1.8901

Only NOx, CO, and SO2 are considered for an average 1-hour Ambient Air Quality Standard.

NOx, CO, and SO2 one (1) hr rates are from taken from the natural gas pilot and flare emissions

Modeling Worst-Case 3 hr Emissions

SO_2 (lb/3-hr)	45.00
SO_2 (g/sec)	1.8901

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard.

Pounds per 3-hr assumes approximately 3 hours the natural gas pilot and flare emissions.

Modeling Worst-Case 8 hr Emissions

CO (lb/8-hr)	275.39
CO (g/sec)	4.337

Only CO is considered for an average 8-hour Ambient Air Quality Standard.

Pounds per 8-hr assumes approximately 8 hours of pilot and flare operation.

Modeling Worst-Case 24 Hour Emissions

SO_2 (lb/24-hr)	120.01
SO_2 (g/sec)	0.6301
PM_{10} = $PM_{2.5}$ (lb/24-hr)	10.34
PM_{10} = $PM_{2.5}$ (g/sec)	0.0543

Only SO_2 and PM are considered for an average 24-hour Ambient Air Quality Standard.

SO_2 and PM pounds per 24-hr assume approximately 24 hours of pilot operation and 8 hours of flare operation.

Modeling Annual Average Emissions

NOx (g/sec)	0.034
CO (g/sec)	0.023
SO_2 (g/sec)	0.009
PM_{10} = $PM_{2.5}$ (g/sec)	0.001

Pounds per year assumes contributions from both 8760 hrs of pilot operation and 40hrs of SU/SD flaring

Attachment B
Flare Stack Parameter Calculations

Flare Stack Parameters

Hydrogen Energy California LLC

9/9/2010

HECA Project

Parameter	Rectisol Flare (during startup and shutdown)	Gasification Flare (during CTG wash)	SRU Flare (during Gasifier Startup and Shutdown)
Heat release rate for flare+pilot, (10^6 Btu/hr HHV)	430.3	1695.5	36.3
H = Total Heat release rate (cal/s)	3.01E+07	1.19E+08	2.54E+06
Fb = Buoyancy flux	5.00E+02	1.97E+03	4.22E+01
Q_H = sensible heat release rate	1.36E+07	5.34E+07	1.14E+06
Hs = Stack height (m)	76.2	76.2	76.2
AERMOD Input parameters			
He = Effective stack height (m) as calculated in SCREEN3	93.33	109.20	81.45
T = Stack temperature (K)	1273	1273	1273
v = Exit velocity (m/s)	20	20	20
d = effective stack diameter (m)	3.637	7.220	1.056

Flare stack parameters are based on calculated using the SCREEN3 technique
Fb = Buoyancy flux = 1.66 x 10-5 x H
QH = sensible heat release rate = 0.45 x H
He = Effective stack height (m) = Hs + 4.56E-03 * H^0.478

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT
COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION FOR THE *HYDROGEN ENERGY CALIFORNIA PROJECT*

Docket No. 08-AFC-8

PROOF OF SERVICE LIST (Rev. 8/18/10)

APPLICANT

Gregory D. Skannal
Tiffany Rau
Rick Harrison
Hydrogen Energy International LLC
One World Trade Center, Suite 1600
Long Beach, CA 90831
gregory.skannal@hydrogenenergy.com
tiffany.rau@hydrogenenergy.com
rick.harrison@hydrogenenergy.com

Asteghik Khajetoorians,
Senior BP Legal Attorney
BP America, Inc.
6 Centerpointe Drive, LPR 6-550
La Palma, CA 90623
Asteghik.Khajetoorians@bp.com

APPLICANT'S CONSULTANT

Dale Shileikis, Vice President
Energy Services Manager
Major Environmental Programs
URS Corporation
One Montgomery Street, Suite 900
San Francisco, CA 94104-4538
dale_shileikis@urscorp.com

COUNSEL FOR APPLICANT

Michael J. Carroll
Latham & Watkins, LLP
650 Town Center Drive, 20th Fl.
Costa Mesa, CA 92626-1925
michael.carroll@lw.com

INTERESTED AGENCIES

California ISO
e-recipient@caiso.com

INTERVENORS

***California Unions for Reliable Energy**
Thomas A. Enslow
Marc D. Joseph
Adams Broadwell Joseph & Cardozo
520 Capitol Mall, Suite 350
Sacramento, CA 95814
tenslow@adamsbroadwell.com

Tom Frantz
Association of Irritated Residents
30100 Orange Street
Shafter, CA 93263
tfrantz@bak.rr.com

Kern-Kaweah Chapter
of the Sierra Club
Babak Naficy
Law Offices of Babak Naficy
1504 Marsh Street
San Luis Obispo, California 93401
babaknaficy@sbcglobal.net

Environmental Defense Fund (EDF)
Timothy O'Connor, Esq.
1107 Ninth St., Suite 540
Sacramento, CA 95814
toconnor@edf.org

Natural Resources Defense Council (NRDC)
George Peridas
111 Sutter Street, 20th Fl.
San Francisco, CA 94104
gperidas@nrdc.org

ENERGY COMMISSION

JAMES D. BOYD
Vice Chair and Presiding Member
jboyd@energy.state.ca.us

JEFFREY D. BYRON
Commissioner and Associate Member
jbyron@energy.state.ca.us

Raoul Renaud
Hearing Officer
rrenaud@energy.state.ca.us

Kristy Chew
Adviser to Commissioner Boyd
e-mail service preferred
kchew@energy.state.ca.us

Rod Jones
Project Manager
rjones@energy.state.ca.us

Lisa De Carlo
Staff Counsel
ldecarlo@energy.state.ca.us

Jennifer Jennings
Public Adviser's Office
e-mail service preferred
publicadviser@energy.state.ca.us

DECLARATION OF SERVICE

I, Dale Shileikis , declare that on September 22 , 2010, I served and filed copies of the attached Flare Memo to SJVAPCD , dated September 13 , 2010. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[www.energy.ca.gov/sitingcases/hydrogen_energy]**.

The documents have been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

FOR SERVICE TO ALL OTHER PARTIES:

X sent electronically to all email addresses on the Proof of Service list;

_____ by personal delivery;

X By delivering on this date, for mailing with the United States Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses **NOT** marked "email preferred."

AND

FOR FILING WITH THE ENERGY COMMISSION:

X sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (***preferred method***);

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-8
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.