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Supplemental Responses to CEC Requests Regarding Carbon Sequestration and Greenhouse Gas Emissions

Amended Application for Certification for HYDROGEN ENERGY CALIFORNIA (08-AFC-8A) Kern County, California

Prepared for:
Hydrogen Energy California LLC

hydrogen energy california

Submitted to:

California Energy Commission

U.S Department of Energy

Prepared by:

URS

October 2013

SUPPLEMENTAL RESPONSES TO CEC REQUESTS REGARDING CARBON SEQUESTRATION AND GREENHOUSE GAS EMISSIONS

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LIST OF ACRONYMS AND ABBREVIATIONS USED IN RESPONSES

AGR	acid gas removal
ASU	air separation unit
CEC	California Energy Commission
CTG	combustion turbine generator
DEIS	Draft Environmental Impact Statement
°F	degrees Fahrenheit
HECA	Hydrogen Energy California
HRSG	heat recovery steam generator
HVAC	heating, ventilation, and air conditioning
kpph	thousand pounds per hour
MRV Plan	Monitoring, Reporting, and Verification Plan
NO_X	oxides of nitrogen
OEHI	Occidental of Elk Hills, Inc.
PSA	Preliminary Staff Assessment
SB	Senate Bill
syngas	synthesis gas
wt%	percent weight

SUPPLEMENTAL RESPONSES TO CEC INFORMATION REQUESTS

BACKGROUND

The Applicant provided responses to California Energy Commission (CEC) Staff's Preliminary Staff Assessment (PSA)/Draft Environmental Impact Statement (DEIS) Information Requests related to Carbon Sequestration and Greenhouse Gas Emissions. Set 1 Responses were docketed on August 9, 2013, and Set 2 Responses were docketed on September 3, 2013. On September 9, 2013, CEC Staff provided follow-up questions related to the submitted responses. Applicant's supplemental responses to these questions are provided herein.

INFORMATION REQUEST

1. In reviewing the first and second set of PSA Information Request Responses I have follow-up questions or issues:

1.a. CS-1 – This response was overly general and didn't really answer the questions. When will the applicant actually enter into a formal contract with OEHI? Staff believes that such a contract is required prior to project approval since the project cannot be approved without ensuring carbon sequestration and that cannot be assured without a formal guarantee that OEHI will participate as proposed.

SUPPLEMENTAL RESPONSE

SCS Energy LLC is currently negotiating with Occidental of Elk Hills, Inc. (OEHI) and is endeavoring to finalize a contract by the end of 2013, although this schedule could extend into 2014. However, it should be recognized that finalization of the contract is dependent to some extent on the CEC's review of the Project, and particularly its review of the Monitoring, Reporting, and Verification Plan (MRV Plan). As stated in the response to Information Request CS-1, the contract will require OEHI to fully implement the MRV Plan, which will demonstrate how the enhanced oil recovery will result in carbon sequestration. Therefore, it is necessary to have the MRV Plan in final, or near final, form before the contract between Hydrogen Energy California (HECA) and OEHI can be finalized, to ensure that OEHI's obligations under the MRV Plan are fully reflected in the contract. To the extent that the MRV Plan is subject to change based on the CEC's ongoing review, it would be premature to finalize the contract between HECA and OEHI. Therefore, it may not be possible to finalize the contract between HECA and OEHI prior to Project approval, in which case this issue could be addressed through a Condition of Certification requiring a contract that obligates the parties to fully implement the MRV Plan.

INFORMATION REQUEST

1.b. CS-5 – I don't have any issues with this response, but Karim may and he has indicated that other data responses provided last summer that have pointed to the MRV are inadequate due to inadequacies with the MRV, such as when the MRV provides generic statements, such as "we will use the appropriate method…" or similar without spelling out what that is and what they will actually do, nor specifying the who does what by when. This is creating issues with our completion of adequate mitigation measures.

SUPPLEMENTAL RESPONSE

As noted at the recent September 17, 2013, workshop, OEHI representatives will clarify specific monitoring techniques in the MRV Plan to address CEC staff concerns. To the extent that Staff believes that the MRV Plan is in any way deficient or too generic, Staff should identify their concerns so that the MRV Plan can be modified prior to finalization of the contract between HECA and OEHI. The more specific that CEC Staff can be about its concerns regarding the MRV Plan, the better OEHI will be able to respond to those concerns.

INFORMATION REQUEST

1.c. CS-6 – The response does not address issues with fulfilling energy contracts if a shutdown is mandated due to the CO_2 venting hours limit being reached. Might a variance be requested to allow additional venting hours, assuming there are no other regulatory consequences, or might a variance for additional natural gas operation be requested, or will your energy contract have provisions that allow early annual shutdown based on regulatory limit compliance such as CO_2 venting?

SUPPLEMENTAL RESPONSE

As stated in the response to Information Request CS-6, and as required by proposed Condition of Certification GHG-2, the Project would comply by shutting the plant down if the venting limit is reached and additional venting were needed. The Project has no plans to seek variances to allow for additional venting hours, and does not anticipate that such circumstances would occur during normal operations. All energy contracts will include conservative availability hours so that a variance would not be needed.

INFORMATION REQUEST

1.d. CS-7A - Are these diagrams showing actual hourly basis or average hourly basis, or some other basis? Figure CS-7-2 should include the ASU.

SUPPLEMENTAL RESPONSE

Figures CS-7-1 and CS-7-2 submitted on August 9, 2013 are on an average hourly basis; they are design values based on the Heat and Material Balance.

The air separation unit (ASU) is not included in Figures CS-7-1 and CS-7-2 because carbon dioxide will not be one of the gases that HECA buys from the ASU owner. In addition, there is a negligible amount of carbon dioxide in air.

INFORMATION REQUEST

1.e. CS-7B – This response has the following issues: 1) equipment level data was not provided as requested nor did we get a spreadsheet to review the calculations; 2) ASU was not included in the figure; 3) An explicit definition of what comprises the "other supporting systems" is not provided nor rationale for their exclusion.

SUPPLEMENTAL RESPONSE

1. Sufficient information was provided to analyze the environmental impacts of the Project. Further breakdown of the equipment auxiliary loads is not only onerous, but also includes confidential data about the operation of the facility. The Senate Bill (SB) 1368 calculations that are described in the responses to Information Requests were provided to CEC in a spreadsheet on May 9, 2013, as described in the Record of Teleconference re SB 1368 Compliance, docketed on May 15, 2013 (TN 70829). Spreadsheet calculations were also provided to CEC with the SB 1368 white paper that was docketed on October 23, 2013.

2. The ASU will be owned and operated by a third party, and provides a product to the facility that HECA purchases; therefore, it should not be included in this figure. In addition, the auxiliary loads of the ASU are described in response to Information Request CS-7I.

3. "Other supporting systems" includes the balance of plant facilities, such as plant lighting, building heating, ventilation, and air conditioning (HVAC), recovered condensate pumps, etc. This line item was not excluded from the auxiliary load; it was included in the Common allocation.

INFORMATION REQUEST

1.f. CS-7C – The ASU is not included in Table CS-7-1.

SUPPLEMENTAL RESPONSE

The ASU will be owned and operated by a third party, and provides a product to the facility that HECA purchases; and therefore should not be included in this table. The auxiliary loads of the ASU are described in response to Information Request CS-7I.

INFORMATION REQUEST

1.g. CS-7E – Can you please explain why the PSA off-gas consumption is moving in the opposite direction from the syngas in terms of allocation between the two operating cases?

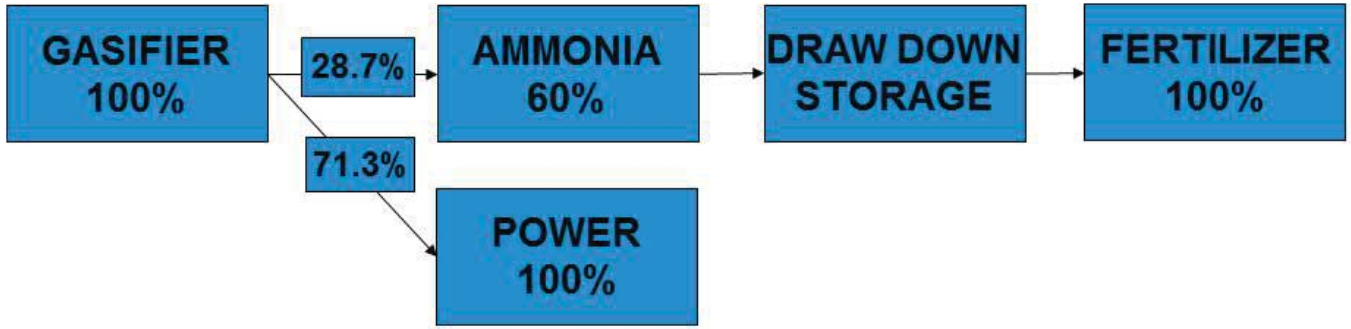
SUPPLEMENTAL RESPONSE

To better understand the difference in the two operating modes, on-peak power and off-peak power (or maximum fertilizer/ammonia production), see Figure CS-7E-1, Daily Operation Modes; and Figure CS-7E-2, Daily Operation Cycles. PSA off-gas is a by-product of producing pure hydrogen suitable for the feedstock requirements of the ammonia unit. The PSA off-gas is used beneficially as a fuel for the power block during both peak and off-peak power production. During peak power production, the PSA is operating at 60 percent capacity, and the quantity of off-gas is proportional. During maximum ammonia production (off-peak), the PSA is operating at 100 percent capacity, and the quantity of off-gas is proportional. The quantity of PSA off-gas produced is directly proportional to the amount of ammonia produced, and therefore inversely proportional to the power block output.

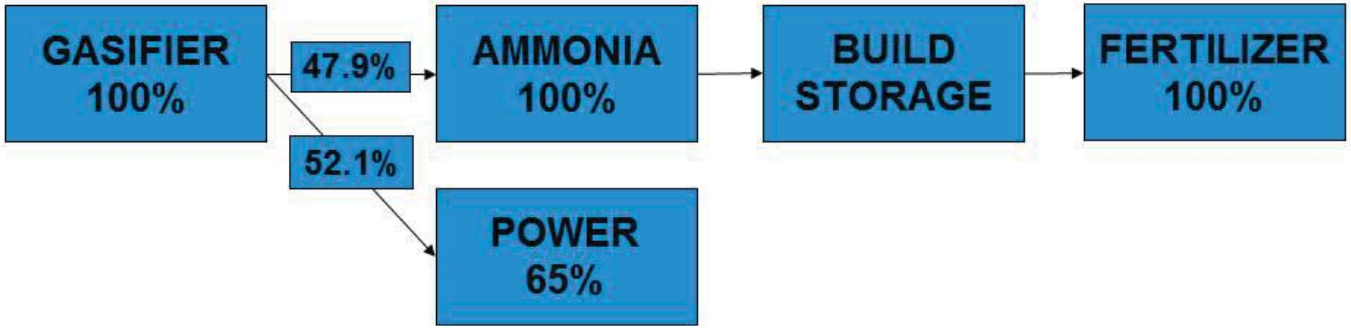
DAILY OPERATION MODES

hydrogen energy

- MAXIMUM POWER PRODUCTION (16 Hours/Day)



- MAXIMUM AMMONIA PRODUCTION (8 Hours/Day)



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DAILY OPERATION MODES

October 2013
28068052

Hydrogen Energy California (HECA)
Kern County, California

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FIGURE CS-7E-1

DAILY OPERATION CYCLES

- About 2/3 of Syngas is Used to Produce Power – Daily Average Basis
- MAXIMUM POWER PRODUCTION (16 Hours/Day)
  - Gasifier through AGR operates at 100%
  - About 71% of syngas goes to the power block
  - Syngas duct burner is on
  - PSA and ammonia plant operate at 60%
  - Urea and UAN operate at 100% and draw down from intermediate ammonia storage
- MAXIMUM AMMONIA PRODUCTION (8 Hours/Day)
  - Gasifier through AGR operates at 100%
  - About 52% of syngas goes to the power block
  - Syngas duct burner is off
  - PSA and ammonia plant operate at 100%
  - Urea and UAN operate at 100% and inventory builds in intermediate ammonia storage

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DAILY OPERATION CYCLES

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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE CS-7E-2

10/21/13 vsa...T:\HECA-SCS 2012\Data Requests\PSA DEIS\FigCS7E-2_daily_op_cycles.ai

INFORMATION REQUEST

1.h. CS-7F - The net power value calculations vs. the common allocation appears to be double counting for the fertilizer plant (both subtracting emissions from the numerator and adding net MW to the denominator for the same generation/emissions quantity which should not be handled differently…if included in the denominator as part of the net generation then the emission from that net generation must be included in the numerator)…the CTG/HRSG burning syngas/PSA off-gas emissions are already covered due to netting out of the power consumed by the fertilizer plant. We don't believe that you can allocate emissions to the fertilizer and include the power used by the fertilizer plant in the net power produced…this appears to be a clear example of double counting. We believe that the CTG/HRSG emissions under all fuels should be allocated solely to power, and believe the same is true for the auxiliary boiler, unless it also serves the fertilizer plant. Please indicate very clearly how this allocation scheme would not be double counting.

SUPPLEMENTAL RESPONSE

Please refer to the Applicant's White Paper regarding the updated SB 1368 compliance determination and associated calculations.

INFORMATION REQUEST

1.i. CS-7I – We requested detailed calculations and assumptions to support any ASU power allocation if that was provided within the response, and while allocation percentages were provided the requested detail was not. Without these assumptions/calculations and without more information on the ASU operation as noted below, ASU power allocation cannot not be considered in staff's SB 1368 calculations. The consumption of the ASU produced gases would be different in allocation percentages than other power/common/fertilizer allocations calculated. There also appear to be some errors or missing information…such as not all of the oxygen goes to the gasifier; a small amount goes to the SRU.

SUPPLEMENTAL RESPONSE

Please refer to the Applicant's White Paper regarding the updated SB 1368 compliance determination and associated calculations. The sulfur recovery unit is part of the Gasification block, just like the gasifier; therefore, the allocation remains the same.

INFORMATION REQUEST

1.j. CS-7K - This response didn't answer the question regarding off-peak emissions. Staff would like to understand the differences in emissions between on-peak and off-peak operation for all HECA emissions sources whose emissions are affected by this daily swing in operation. We also need to know how rapidly HECA could swing from electricity maximizing mode to fertilizer maximizing mode, and could this increment of HECA's electricity production be dispatched by the CAISO.

SUPPLEMENTAL RESPONSE

Emissions for all sources were calculated based on their maximum potential emission rates, whether operating in on-peak or off-peak mode. Therefore, the information presented in Appendix E (and most recently in the Updated Emissions and Modeling Report) presents the worst-case emissions from all sources for evaluating environmental impacts of the Project. Lower emissions could not result in more significant impacts.

Emissions are constant between on-peak and off-peak for some species, specifically carbon and sulfur. The carbon emitted to the atmosphere is dependent on the quantity of carbon exiting the acid gas removal (AGR) system. The AGR operation is constant 24 hours per day, as is the carbon contained in the clean synthesis gas (syngas) exiting the AGR. Sulfur is similarly constant because all of the sulfur contained in the syngas ends up at the power block. Oxides of nitrogen (NO_X) do in fact go down during off-peak operation, because the mass flow of gas turbine exhaust goes down and the concentration of NO_X in the exhaust is equal to or less than the value at on-peak operation.

HECA can transition between on-peak and off-peak operation modes in 1 hour each direction. Dispatch by the California Independent System Operator is a commercial issue between HECA and the utilities.

INFORMATION REQUEST

1.k. CS-7M – This response refers to other responses that don't really appear to be answering all of these questions as asked. Specifically, right now I don't see clear answers on recordkeeping measures…the FDOC has some recordkeeping requirements but it doesn't specify the measures. I send you more explicit follow-up questions on this response prior to the workshop.

SUPPLEMENTAL RESPONSE

Please refer to the Applicant's White Paper regarding the updated SB 1368 one-time compliance, ongoing recordkeeping for SB 1368 compliance is not necessary. In addition, as noted during the September 17, 2013 workshop, OEHI will update the MRV Plan to better describe the monitoring and recordkeeping that it will conduct surrounding the enhanced oil recovery.

INFORMATION REQUEST

2. In regards to the separate ASU Question responses, I have the follow-up questions or issues:

2.a. The responses provided are generic and didn't really address the more quantitative issues of the questions so the follow-up relates to obtaining the needed information more directly as follows:

2.a.i. Please confirm that nitrogen, oxygen, argon, or other gases will not be shipped from the site as products.

SUPPLEMENTAL RESPONSE

An independent third party will design, build, own, and operate the ASU. The current intention is that the ASU will be used to provide products to HECA exclusively, and that any future plans to produce products for offsite shipment would be separately analyzed.

INFORMATION REQUEST

2.a.ii. Please provide a nitrogen, oxygen and hydrogen balance around the gasifier including the ASU input and all other inputs and quantify the amount of oxygen and nitrogen required for other uses at the facility and quantify the amount of gases by type that are vented at the ASU.

SUPPLEMENTAL RESPONSE

A heat and material balance for the entire HECA facility plus products received from the ASU is provided in the response to Workshop Request 1, which has been submitted under confidential cover. Excess inert constituents of air may be vented from the ASU, although quantities are not available from the ASU owner at this time. The Applicant is not clear on how information regarding inert constituents of air vented from the ASU will assist Staff in evaluating the environmental impacts of the Project.

INFORMATION REQUEST

2.a.iii. During staff's review of the ASU and our attempt to obtain balances for oxygen, nitrogen, and hydrogen we discovered two issues. First the water balance provided as Figure A14-2 in the data responses does not show the large amount of water used in the gasification process and the water emissions values presented for the feedstock dryer conflict (are much higher) than those presented in the Visual Resources section Table 5.11-6 of the AFC for use in visible plume modeling. Please identify the amount of water input to the gasification process and identify the correct value for the water in the feedstock

SUPPLEMENTAL RESPONSE

The Amended AFC Table 5.11-6, "Summary of CTG/HRSG Exhaust Conditions," has been updated to show 14 percent moisture in the feedstock dryer exhaust gas. This updated table is also included as Revised Table 5.11-6 in the HECA Project Refinements that was docketed with the CEC on October 18, 2013.

Parameter	**CTG/HRSG Exhaust**					
Stack Height	65 meters (213 feet)					
Stack Diameter	7.3 meters (24 feet)					
Ambient Temperature	**39°F**		**65°F**		**97°F**	
HRSG Stack	**On Peak**	**Off Peak**	**On Peak**	**Off Peak**	**On Peak**	**Off Peak**
Full Load Exhaust Temperature (°F)	200	200	200	200	200	200
Full Load Exhaust Flow Rate (kpph)	4,879	3,959	4,716	3,751	4,578	3,497
Full Load Exhaust Moisture Content (wt%)	7.3	6.4	7.9	7.0	8.5	7.6
Feedstock Drying Stack	**On Peak**	**Off Peak**	**On Peak**	**Off Peak**	**On Peak**	**Off Peak**
Full Load Exhaust Temperature (°F)	200	200	200	200	200	200
Full Load Exhaust Flow Rate (kpph)	800	800	800	800	800	800
Full Load Exhaust Moisture Content (wt%)	14	14	14	14	14	14

Notes:

The 20°F ambient temperature is an extreme minimum, while 39°F ambient is more representative of minimum monthly average winter conditions.

CTG = combustion turbine generator
°F = degrees Fahrenheit
HRSG = heat recovery steam generator
kpph = thousand pounds per hour
wt% = percent weight

RESPONSES TO WORKSHOP REQUESTS

BACKGROUND

During the PSA/DEIS Workshop held in September 2013, CEC Staff requested additional information regarding carbon sequestration and greenhouse gas emissions. The Applicant attempted to summarize Staff's questions. Responses to these workshop requests are provided herein.

WORKSHOP REQUEST

WR-CS-1 Provide a mass balance for oxygen, carbon dioxide, nitrogen, and ammonia for the entire HECA facility, including the ASU.

RESPONSE

This response is being submitted separately under confidential cover.

WORKSHOP REQUEST

WR-CS-2 Provide the ASU auxiliary loads at the three ambient temperatures.

RESPONSE

ASU auxiliary loads are presented in Table CS-7-4, in response to Information Request CS-7I submitted on August 9, 2013. The information presented is for the annual average temperature; the Applicant believes that for California Environmental Quality Act and National Environmental Policy Act purposes, this level of detail is sufficient.

WORKSHOP REQUEST

WR-CS-3 Provide an explanation that the oxygen is the controlling gas from the ASU and provide the amount of nitrogen vented from the ASU.

RESPONSE

HECA uses slightly more oxygen than nitrogen, as described in the heat and material balance in the response to Workshop Request WR-CS-1. It is HECA's understanding that the ASU owner will vent the excess nitrogen. The exact quantity of nitrogen that will be vented will be determined by the ASU owner.

WORKSHOP REQUEST

WR-CS-4 Will there be any change in exhaust temperature or flow from the feedstock dryer?

RESPONSE

There may be slight variations in the exhaust temperature or flow rate from the feedstock dryer, but the worst-case parameters were analyzed in the air quality modeling.

WORKSHOP REQUEST

WR-CS-5 Provide the availability of the power block, gasifier and both combined.

RESPONSE

This response is being submitted separately under confidential cover.

WORKSHOP REQUEST

WR-CS-6 Describe potential unplanned outages and the probability of occurrence

RESPONSE

This response is being submitted separately under confidential cover.