

Responses to CEC Workshop Requests: Nos. A33 through A37

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

Prepared for:
Hydrogen Energy California LLC



Submitted to:



**California Energy
Commission**



**U.S. Department
of Energy**

California Energy Commission

**DOCKETED
08-AFC-8A**

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Prepared by:

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**RESPONSES TO WORKSHOP REQUESTS A33 THROUGH A37
FROM CALIFORNIA ENERGY COMMISSION (CEC)**

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LIST OF ACRONYMS AND ABBREVIATIONS USED IN RESPONSES

CEC	California Energy Commission
CO	carbon monoxide
lbs/day	pounds per day
mph	miles per hour
NO _x	oxides of nitrogen
PM ₁₀	particulate matter 10 microns in diameter or less
PM _{2.5}	particulate matter 2.5 microns in diameter or less
ROG	Reactive organic gases
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO ₂	sulfur dioxide
U.S. EPA	United States Environmental Protection Agency
VMT	vehicle miles traveled

Technical Area: Air Quality/Greenhouse Gases

Author: William Walters

WORKSHOP REQUEST

A33. Provide an update of the Voluntary Emission Reduction Agreement being worked out with SJVAPCD, as well as, the anticipated and possibly related changes in approach for the General Conformity Analysis.

RESPONSE

The Applicant is continuing to work with the San Joaquin Valley Air Pollution Control District (SJVAPCD) to formulate a mutually agreeable Voluntary Emission Reduction Agreement, and with the SJVAPCD and U.S. Department of Energy to come to consensus on an approach to General Conformity. These discussions are ongoing. The General Conformity approach is part of these discussions. This process is ongoing, and the California Energy Commission (CEC) will be updated as soon as an agreement has been reached.

WORKSHOP REQUEST

A34. Status of DRs 130, 131, 135 – Specifically, confirmation of enclosed hopper cars and MATS calculations.

RESPONSE

Calculations demonstrating compliance with the MATS standard were presented in the Applicant's response to CEC Data Request A135, docketed with the CEC on October 11, 2012.

As stated in the Applicant's previously submitted response to Sierra Club Data Request 42, the Applicant had initially assumed that all rail cars would be covered. It has since been determined that they will be uncovered, and a chemical surfactant will be applied to limit fugitive dust. The response provided herein replaces the Applicant's response to Sierra Club Data Request 42, and provides the response to CEC Data Requests A130 and A131.

The applied surfactant has a control efficiency of at least 85 percent. Potential uncontrolled emissions were calculated, and then the minimum control efficiency was applied. These calculations are presented in detail in Attachment A34-1, Fugitive Coal Dust.

Currently, there is not a widely accepted and standard method for calculating coal dust losses from moving rail cars. Several studies have been conducted in the United States, Canada, Portugal, and Australia, in an attempt to quantify this emission source using field measurements, wind tunnels, and computational fluid dynamics modeling. There is no universal emission factor due to the large number of variables that affect the emission rate, such as the type of coal, moisture content, and train speed. The most difficult aspect of quantifying this emission source is that there is not an infinite and constant supply of coal fines available for emission; therefore, the emission rate is not constant with time over the length of the trip. The vast majority of emissions will occur early in the trip, when the most available coal fines are present.

For these reasons, the approach for quantifying coal dust fugitives used AP-42, Compilation of Air Pollutant Emission Factors, Section 13.2.5, Industrial Wind Erosion (U.S. EPA, 2012). Each uncovered coal car can be visualized as a coal pile, and the wind speed equal to the speed of the train. The method presented in Section 13.2.5 estimates fugitive emissions based on the fastest wind speed in each period of disturbance (adding to or removing from the pile), assuming that all available fines will be emitted during that time. In this case, there is only one period of disturbance, the loading of the coal in the cars, and the coal is not disturbed again until it is removed at the Project Site. The emissions will primarily occur in the beginning of the trip, when the train starts up and achieves maximum speed. The AP-42 Industrial Wind Erosion equation is applied to each individual car.

Emissions were calculated based on a train speed of 40 miles per hour, the average exposed area of coal in each car, the expected number of coal cars travelling to the Project Site per year, and roughness parameters (roughness height, z_0 , and threshold friction velocity, u_t^*) appropriate for coal (from AP-42). After applying the 85 percent control efficiency for application of chemical surfactants, the total fugitive coal dust from all rail cars along the entire route is 3.85 tons per year of emissions of particulate matter 10 microns in diameter or less, and 0.58 ton per year of emissions of particulate matter 2.5 microns in diameter or less.

It has been assumed that all emitted particulate matter will be lost during the first 100 miles of the trip; therefore all particulate matter emissions have been assigned to transportation emissions in New Mexico. Maximum train speed (wind speed) will certainly be reached within

this time, and according to AP-42, Section 13.2.5.1: "particulate emission rates tend to decay rapidly (half-life of a few minutes) during an erosion event."

Reference

U.S. EPA (United States Environmental Protection Agency), 2012. Technology Transfer Network, Clearinghouse for Inventories and Emissions Factors. Emissions Factors and AP 42, *Compilation of Air Pollutant Emission Factors*. Available online at: <http://www.epa.gov/ttnchie1/ap42/>.

Attachment A34-1
Fugitive Coal Dust Emissions

Industrial Wind Erosion, AP-42 Section 13.2.5

Emission factor (g/m²-yr) = $k \sum P_i$ (from i=1,N) (Equation 2)

Erosion Potential (P_i) (g/m²) = $58 (u^* - u_t^*)^2 + 25(u^* - u_t^*)$ (Equation 3)

- 0.5 k = PM₁₀ particle size multiplier
- 0.075 k = PM_{2.5} particle size multiplier
- 1 N = number of disturbances per year
- 33.76 A = exposed area of coal, m², per car (Table 4.1, Jan 2008 Connell Hatch: exposed area = 33.76 m²)

Use Equation (1) to determine friction velocity:

$u(z) = u^* / 0.4 \times \ln(z/z_0)$

- 17.88 u(z) = fastest mile (m/s) (based on speed of train)
 - distance at which wind speed is measured (m) (based on the height above the coal cars at which wind flow would be
- 0.2 z = laminar; assumed this height is equal to the difference between the height of the locomotive engine and the trailing coal cars)
- 0.003 z₀ = roughness height for uncrusted coal pile (m), from Table 13.2.5-2
- 1.70 u* = friction velocity (m/s), solved for using Equation 1
- 0.55 u_t* = threshold friction velocity (m/s); Table 13.2.5-2 value for ground coal (surrounding coal pile)

Erosion Potential

	P =	105.9 g/m ²	erosion potential corresponding to the observed (or probable) fastest mile of wind for the
			i th period between disturbances, g/m ²
Annual	A =	440,027.8 m ² /yr	exposed area of coal per car (m ²) times number of cars per year

Unmitigated Emissions

Emission factor (g/m²-yr) = $k \sum P_i$ (from i=1,N)

E = 23,305,420 grams PM₁₀ / year
 25.69 tons PM₁₀ / year

E = 3,495,813 grams PM_{2.5} / year
 3.85 tons PM_{2.5} / year

Mitigation Efficiency of Surfactant: 85%

* HECA will be requiring the coal supplier to apply a surfactant to the coal transported by rail to reduce fugitive losses during transport. Surfactant achieves at least an 85% control efficiency.

Mitigated PM₁₀:	3.85 tons PM₁₀ / year
Mitigated PM_{2.5}:	0.58 tons PM_{2.5} / year

* It has been assumed that all emitted PM will be lost during the first 100 miles of the trip and has thus all been assigned to New Mexico. Maximum train speed (and thus wind speed) will certainly be reached within this time, and according to AP-42 Section 13.2.5.1, "particulate emission rates tend to decay rapidly (half-life of a few minutes) during an erosion event."

- 40 train speed, mph
- 0.447 m/s per 1 mph
- 453.6 grams per pound
- 2000 pounds per ton
- 13034 Required rail car loads per year at normal operation (cars/yr)

WORKSHOP REQUEST

A35. Please provide a list of where to find the latest emissions estimates for all HECA emissions sources. There are a number of data response rounds, including different response parties, and we understand some are in peripheral data sources such as the response to the District incompleteness letter, so such a list will allow us to ensure the PSA is using the correct values

RESPONSE

A list of changes to criteria pollutant, greenhouse gas, and toxic air contaminant emissions estimates from construction activities and operations from both stationary and transportation sources is included as Attachment A35-1, Emission Source Modification List.

Attachment A35-1
Emission Source Modification List

Emission Source Modification List

Since the submittal of the Amended Application for Certification (AFC), emissions from some sources have changed due to Project refinements and in response to data requests. Changes that have affected emissions estimates, and the details of the filing where each change is presented, are summarized below. All of these changes are included in the updated criteria pollutant, greenhouse gas (GHG) and toxic air contaminant (TAC) spreadsheets docketed confidentially with the California Energy Commission (CEC) on November 30, 2012.

Operations Emissions – Stationary Sources

CTG/HRSG and Coal Dryer

- Minor decrease in mercury emissions due to better control identified by vendor. Information presented in response to CEC Data Request A135 on October 10, 2012.
- Reduction in startup hours for coal turbine generator (CTG) and coal dryer at 40 percent load on synthetic gas from 50 hours to 2 hours, which causes a reduction in all pollutant emissions. Provided via email to Homero Ramirez, San Joaquin Valley Air Pollution Control District (SJVAPCD), on September 26, 2012.

Flares

- As discussed with SJVAPCD, Best Available Control Technology for the pilot is 0.068 pounds per million British thermal units for oxides of nitrogen (NO_x), resulting in a very minor NO_x reduction. Provided via email to Homero Ramirez, SJVAPCD, on November 5, 2012.

Nitric Acid Unit

- Ammonia and nitrous oxide emissions increased due to new information provided by the vendor. These emissions are described in the response to the Notice of Incomplete Application provided to SJVAPCD on August 1, 2012.

Fugitives

- In the response to CEC Data Request A16 on August 22, 2012, fugitive emissions for both the gasification block and the fertilizer complex were updated to reflect the refined Project design. Minor changes in emissions of criteria pollutants, GHGs, and TACs occurred.

Methanol and Diesel Tanks

- In the response to Sierra Club Data Request 76 on October 3, 2012, emissions of the volatile organic compounds (VOCs) from the methanol tank and diesel storage tanks were provided. This results in a very small increase in methanol and VOC emissions.

Material Handling

- As described in the response to the Notice of Incomplete Application provided to SJVAPCD on August 1, 2012, modifications were made to the material handling

baghouses due to Project refinements. New process flow diagrams for the material handling system were provided.

- Through email communication with SJVAPCD staff, modified material handling emissions were provided to match the updated material handling system. The emission calculations for the currently proposed material handling system are provided in the revised criteria pollutant operations spreadsheet.

The main changes in the solids handling emission control equipment are the following:

1. An additional baghouse, Source 21, has been added to control particulate matter from the inlet of the gasification coal/petroleum coke grinding system.
2. Source 24 in the original permit application has been removed. Source 24 now identifies a new dust collector at the gasification solids drainage/drying pad.
3. Source 28, the gasification solids transfer tower, has been moved across the road and pipe rack from the gasification solids pad.
4. The fugitive dust calculation for material handling on the gasification solids pad has been divided into two parts to account for the difference in material moisture content for placement versus removal and the corresponding different emission factors.
5. Terminology used in the emission summary table and emission source plot plan has been revised to be consistent with the latest process flow diagrams.

Operations Emissions – Transportation

Changes to the transportation emissions for both Alternative 1 (Rail Transportation , Amended AFC Appendix E-5) and Alternative 2 (Truck Transportation, Amended AFC Appendix E-12) were presented in the General Conformity Evaluation (docketed with the CEC on September 14, 2012) and also in response to data requests as noted. These changes affected the transportation criteria pollutant and diesel particulate matter emissions for Alternatives 1 and 2. These changes did not affect GHG or other TAC emissions.

Onsite Train

- At the recommendation of the CEC, emission factors used in the train calculations came from the U.S. Environmental Protection Agency's (U.S. EPA) Technical Highlights: Emission Factors for Locomotives, April 2009 (<http://www.epa.gov/nonroad/locomotv/420f09025.pdf>). This change was noted in the response to CEC Data Request A18 on August 22, 2012. This resulted in a decrease in criteria pollutants and diesel particulate matter.

Offsite Train

- The transportation-related emissions in 2017, when the construction and operation phases overlap, were calculated and included in the new spreadsheets.
- The travel distances for trucks and trains in each affected area were refined and revised.
- The train emissions were calculated using U.S. EPA Tier 3 emission factors, locomotive conversion factors, and locomotive load factors. At the recommendation of the CEC, the emission factors used in the train calculations came from the U.S. EPA's Technical Highlights: Emission Factors for Locomotives, April 2009 (<http://www.epa.gov/nonroad/locomotv/420f09025.pdf>). This change was presented in the response to CEC Data Request A18 on August 22, 2012.
- Fugitive coal dust emissions from coal trains were calculated and presented in the response to CEC Workshop Data Request A34 included in this submittal.

Construction Emissions

All changes made to construction emissions apply to fugitive PM₁₀ and PM_{2.5}.

- The estimated daily mileage for scrapers was changed using the methodology from CalEEMod, as presented in the response to CEC Data Request A5 on August 22, 2012.
- The estimated daily mileage for graders was changed to the average speed from the Caterpillar construction equipment guide at the recommendation of CEC Staff. This change was incorporated into the response to CEC Workshop Data Request A1 on November 5, 2012.
- The unpaved road emission factor was updated to use the average vehicle weight as recommended in AP-42, and presented in the response to CEC Data Request A7 on August 22, 2012.
- At the recommendation of CEC, the mitigation efficiencies for reduced travel speed and watering were revised to use the updated South Coast Air Quality Management District CEQA values and which activities they apply to, as presented in the response to CEC Workshop Request A1 on November 5, 2012.
- In response to CEC Workshop Request A1 on November 5, 2012, the mileage for the paved and unpaved sections of the onsite access road were updated to more accurately represent the site configuration. A summary of changes in fugitive emissions from construction activity and updated modeling results were also provided in this response.
- Scraper emissions were updated to include not only topsoil removal by scrapers, but also emissions from scraper travel and unloading. These changes and a summary of emissions are presented in the response to CEC Workshop Request A36, included in this submittal.

WORKSHOP REQUEST

A36. A4/A5 – Treatment of scraper travel emissions cannot be easily found, staff needs to understand how all of the AP-42 guidance for scraper emissions (scraping, unloading, travel) was followed.

RESPONSE

Emissions from scraping (topsoil removal by scraper, from AP-42, Table 11.9-4) were previously included in the construction emissions spreadsheet. Emissions from scraper unloading (AP-42, Compilation of Air Pollutant Emission Factors, Table 11.9-4) and travel (AP-42, Table 11.9-1) have been incorporated into the total construction emissions presented in Table A36-1. Unloading emissions are based on the amount of material handled by the scrapers per day; this is equal to the amount of material handled from scraping (topsoil removal). Emissions from scraper travel are based on the scrapers' vehicle miles traveled (VMT). It is assumed that fugitive dust from travel occurring during the activities of scraping or unloading is already included in those emission factors. Therefore, the daily VMT for scrapers in travel mode (no scraping or unloading underway) will be extremely minimal, because the units will not be travelling on the Project Site except when being used for their intended purpose. A daily VMT of 0.9 mile per scraper has been assumed in these emissions calculations, based on the methodology used in CalEEMod and described in the Applicant's response to CEC Data Request A5. A summary of scraper emissions is provided in Table A36-2.

**Table A36-1
 Estimated Daily Maximum Construction Emissions of Criteria Pollutants (lbs/day)**

Activity	PM ₁₀	PM _{2.5}	CO	ROG	NO _x	SO ₂
Project Construction Emissions						
Onsite Combustion Emissions						
Construction Equipment – On-road	4.72	4.25	63.46	23.48	131.41	0.13
Construction Equipment – Off-road	13.02	11.98	168.18	52.74	253.50	0.32
Worker Vehicles	0.00	0.00	4.82	0.37	0.39	0.008
Delivery Trucks	1.824	1.654	2.205	1.359	5.138	0.004
Onsite Fugitive Emissions						
Construction Equipment – On-road	9.10	0.91				
Construction Equipment – Off-road	1.35	0.13				
Worker Vehicles	1.09	0.11				
Delivery Trucks	89.19	9.08				
Construction Activity	220.30	62.90				
Subtotal of Project Emissions	340.6	91.0	238.7	77.9	390.4	0.5
Offsite Construction Emissions						
Offsite Combustion Emissions						
Worker Vehicles	0.16	0.08	369.57	11.37	44.24	0.437
Delivery Trucks	11.13	9.54	15.40	3.40	78.16	0.07
Offsite Paved Road Fugitive Dust Emissions						
Worker Vehicles	0.35	0.09				
Delivery Trucks	14.00	3.44				
Subtotal of Offsite Emissions	25.65	13.15	384.96	14.77	122.41	0.51
Total Maximum Daily Emissions (lbs/day)	366	104	624	93	513	1

Notes:

CO = carbon monoxide
 lbs/day = pounds per day
 NO_x = oxides of nitrogen
 PM₁₀ = particulate matter less than 10 microns in diameter

PM_{2.5} = particulate matter less than 2.5 microns in diameter
 ROG = reactive organic gases
 SO₂ = sulfur dioxide

**Table A36-2
 Scraper Emissions During Construction**

Activity	Scraping (removing topsoil)	Unloading	Travel Only
Emission Factor Source	AP-42 Table 11.9-4	AP-42 Table 11.9-4	AP-42 Table 11.9-1
Calculation based on:	Material handled by scrapers in one day	Material handled by scrapers in one day	Speed of 15 mph, daily VMT = 0.9 miles per scraper
Mitigation applied	Watering	Watering	Watering
PM ₁₀ Emissions (lb/day) (peak month)	22.3	15.3	16.8
Maximum month (lb/day)			54.4

Notes:

mph – miles per hour
 PM₁₀ = particulate matter less than 10 microns in diameter
 VMT = vehicle miles traveled

WORKSHOP REQUEST

A37. A127 – Please provide a short list (name/city/rough est. of distance) to confirm that there are transloading/distribution facilities that can handle product within 40 miles of the site on average.

RESPONSE

The Applicant has submitted the requested information confidentially.



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***AMENDED APPLICATION FOR CERTIFICATION FOR THE
HYDROGEN ENERGY CALIFORNIA PROJECT***

**Docket No. 08-AFC-08A
(Revised 11/20/12)**

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DECLARATION OF SERVICE

I, Dale Shileikis, declare that on December 19, 2012, I served and filed a copy of the attached Responses to CEC Workshop Requests: Nos. A33 through A37, dated December, 2012. This document is accompanied by the most recent Proof of Service list, located on the web page for this project at: http://www.energy.ca.gov/sitingcases/hydrogen_energy/index.html

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit or Chief Counsel, as appropriate, in the following manner:

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For service to all other parties:

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CALIFORNIA ENERGY COMMISSION – DOCKET UNIT
Attn: Docket No. 08-AFC-08A
1516 Ninth Street, MS-4
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OR, if filing a Petition for Reconsideration of Decision or Order pursuant to Title 20, § 1720:

- Served by delivering on this date one electronic copy by e-mail, and an original paper copy to the Chief Counsel¹ at the following address, either personally, or for mailing with the U.S. Postal Service with first class postage thereon fully prepaid:

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I declare under penalty of perjury under the laws of the State of California 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.



¹ This Proof of Service form is not appropriate for the use when filing a document with the Chief Counsel under Title 20, sections 1231 (Complaint and Request for Investigation) or 2506 (Petition for Inspection or Copying of Confidential Records). The Public Advisor can answer any questions related to filing under these sections.