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*Unofficial electronic compilation of the  
U.S. EPA Final Rule on Mandatory Reporting of Greenhouse Gases  
incorporated by reference in California's Regulation for the  
Mandatory Reporting of Greenhouse Gas Emissions*

### Unofficial Electronic Compilation

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*ARB's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (title 17, California Code of Regulations (CCR), sections 95100-95157) incorporated by reference certain requirements promulgated by the United States Environmental Protection Agency (U.S. EPA) in its Final Rule on Mandatory Reporting of Greenhouse Gases (Title 40, Code of Federal Regulations (CFR), Part 98). Specifically, section 95100(c) of ARB's regulation incorporated those requirements promulgated by U.S. EPA as published in the Federal Register on October 30, 2009, July 12, 2010, September 22, 2010, October 28, 2010, November 30, 2010, December 17, 2010, and April 25, 2011.*

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**40 CFR Part 98  
Subpart P**

**Mandatory Reporting of Greenhouse Gases**

**PART 98—MANDATORY GREENHOUSE GAS REPORTING**

**Subpart P—Hydrogen Production**

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**§98.160 Definition of the source category.**

(a) A hydrogen production source category consists of facilities that produce hydrogen gas sold as a product to other entities.

(b) This source category comprises process units that produce hydrogen by reforming, gasification, oxidation, reaction, or other transformations of feedstocks.

(c) This source category includes merchant hydrogen production facilities located within another petroleum refinery if they are not owned by, or under the direct control of, the other facility's owner and operator.

**§98.161 Reporting threshold.**

You must report GHG emissions under this subpart if your facility contains a hydrogen production process and the facility meets the requirements of either §98.2(a)(1) or (a)(2).

**§98.162 GHGs to report.**

You must report:

(a) CO<sub>2</sub> emissions from each hydrogen production process unit.

(b) [Reserved]

(c) CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions from each stationary combustion unit other than hydrogen production process units. You must calculate and report these emissions under subpart C of this part (General Stationary Fuel Combustion Sources) by following the requirements of subpart C.

(d) For CO<sub>2</sub> collected and transferred off site, you must follow the requirements of subpart PP of this part.

**§98.163 Calculating GHG emissions.**

You must calculate and report the annual CO<sub>2</sub> emissions from each hydrogen production process unit using the procedures specified in either paragraph (a) or (b) of this section.

(a) Continuous Emissions Monitoring Systems (CEMS). Calculate and report under this subpart the CO<sub>2</sub> emissions by operating and maintaining CEMS according to the Tier 4 Calculation Methodology specified in §98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(b) Fuel and feedstock material balance approach. Calculate and report CO<sub>2</sub> emissions as the sum of the annual emissions associated with each fuel and feedstock used for hydrogen production by following paragraphs (b)(1) through (b)(3) of this section.

(1) Gaseous fuel and feedstock. You must calculate the annual CO<sub>2</sub> emissions from gaseous fuel and feedstock according to Equation P-1 of this section:

$$CO_2 = \left( \sum_{n=1}^k \frac{44}{12} * Fdstk_n * CC_n * \frac{MW}{MVC} \right) * 0.001 \quad (\text{Eq. P-1})$$

Where:

- CO<sub>2</sub> = Annual CO<sub>2</sub> emissions arising from fuel and feedstock consumption (metric tons/yr).
- Fdstk<sub>n</sub> = Volume of the gaseous fuel and feedstock used in month n (scf (at standard conditions of 68 °F and atmospheric pressure) of fuel and feedstock).
- CC<sub>n</sub> = Average carbon content of the gaseous fuel and feedstock, from the results of one or more analyses for month n (kg carbon per kg of fuel and feedstock). If measurements are taken more frequently than monthly, use the arithmetic average of measurement values within the month to calculate a monthly average.
- MW<sub>n</sub> = Average molecular weight of the gaseous fuel and feedstock from the results of one or more analyses for month n (kg/kg-mole).
- MVC = Molar volume conversion factor (849.5 scf per kg-mole at standard conditions).
- k = Months in the year.
- 44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon. 0.001 = Conversion factor from kg to metric tons.

(2) Liquid fuel and feedstock. You must calculate the annual CO<sub>2</sub> emissions from each liquid fuel and feedstock according to Equation P-2 of this section:

$$CO_2 = \left( \sum_{n=1}^k \frac{44}{12} * Fdstk_n * CC_n \right) * 0.001 \quad (\text{Eq. P-2})$$

Where:

- CO<sub>2</sub> = Annual CO<sub>2</sub> emissions arising from fuel and feedstock consumption (metric tons/yr).
- Fdstk<sub>n</sub> = Volume of the liquid fuel and feedstock used in month n (gallons of fuel and feedstock).
- CC<sub>n</sub> = Average carbon content of the liquid fuel and feedstock, from the results of one or more analyses for month n (kg carbon per gallon of fuel and feedstock).
- k = Months in the year.

44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

0.001 = Conversion factor from kg to metric tons.

(3) Solid fuel and feedstock. You must calculate the annual CO<sub>2</sub> emissions from each solid fuel and feedstock according to Equation P-3 of this section:

$$CO_2 = \left( \sum_{n=1}^k \frac{44}{12} * Fdstk_n * CC_n \right) * 0.001 \quad (\text{Eq.P-3})$$

Where:

CO<sub>2</sub> = Annual CO<sub>2</sub> emissions from fuel and feedstock consumption in metric tons per month (metric tons/yr).

Fdstk<sub>n</sub> = Mass of solid fuel and feedstock used in month n (kg of fuel and feedstock).

CC<sub>n</sub> = Average carbon content of the solid fuel and feedstock, from the results of one or more analyses for month n (kg carbon per kg of fuel and feedstock).

k = Months in the year.

44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

0.001 = Conversion factor from kg to metric tons.

(c) If GHG emissions from a hydrogen production process unit are vented through the same stack as any combustion unit or process equipment that reports CO<sub>2</sub> emissions using a CEMS that complies with the Tier 4 Calculation Methodology in subpart C of this part (General Stationary Fuel Combustion Sources), then the calculation methodology in paragraph (b) of this section shall not be used to calculate process emissions. The owner or operator shall report under this subpart the combined stack emissions according to the Tier 4 Calculation Methodology in §98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

#### **§98.164 Monitoring and QA/QC requirements.**

The GHG emissions data for hydrogen production process units must be quality-assured as specified in paragraphs (a) or (b) of this section, as appropriate for each process unit:

(a) If a CEMS is used to measure GHG emissions, then the facility must comply with the monitoring and QA/QC procedures specified in §98.34(c).

(b) If a CEMS is not used to measure GHG emissions, then you must:

(1) Calibrate all oil and gas flow meters that are used to measure liquid and gaseous feedstock volumes (except for gas billing meters) according to the monitoring and QA/QC requirements for the Tier 3 methodology in §98.34(b)(1). Perform oil tank drop measurements (if used to quantify liquid fuel or feedstock consumption) according to §98.34(b)(2). Calibrate all solids weighing equipment according to the procedures in §98.3(i).

(2) Determine the carbon content and the molecular weight annually of standard gaseous hydrocarbon fuels and feedstocks having consistent composition (e.g., natural gas). For other gaseous fuels and feedstocks (e.g., biogas, refinery gas, or process gas), sample and analyze no less frequently than weekly to determine the carbon content and molecular weight of the fuel and feedstock.

- (3) Determine the carbon content of fuel oil, naphtha, and other liquid fuels and feedstocks at least monthly, except annually for standard liquid hydrocarbon fuels and feedstocks having consistent composition, or upon delivery for liquid fuels delivered by bulk transport (e.g., by truck or rail).
- (4) Determine the carbon content of coal, coke, and other solid fuels and feedstocks at least monthly, except annually for standard solid hydrocarbon fuels and feedstocks having consistent composition, or upon delivery for solid fuels delivered by bulk transport (e.g., by truck or rail).
- (5) You must use the following applicable methods to determine the carbon content for all fuels and feedstocks, and molecular weight of gaseous fuels and feedstocks. Alternatively, you may use the results of continuous chromatographic analysis of the fuel and feedstock, provided that the gas chromatograph (GC) is operated, maintained, and calibrated according to the manufacturer's instructions; and the methods used for operation, maintenance, and calibration of the GC are documented in the written monitoring plan for the unit under §98.3(g)(5).
  - (i) ASTM D1945-03 Standard Test Method for Analysis of Natural Gas by Gas Chromatography (incorporated by reference, see §98.7).
  - (ii) ASTM D1946-90 (Reapproved 2006), Standard Practice for Analysis of Reformed Gas by Gas Chromatography (incorporated by reference, see §98.7).
  - (iii) ASTM D2013-07 Standard Practice of Preparing Coal Samples for Analysis (incorporated by reference, see §98.7).
  - (iv) ASTM D2234/D2234M-07 Standard Practice for Collection of a Gross Sample of Coal (incorporated by reference, see §98.7).
  - (v) ASTM D2597-94 (Reapproved 2004) Standard Test Method for Analysis of Demethanized Hydrocarbon Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography (incorporated by reference, see §98.7).
  - (vi) ASTM D3176-89 (Reapproved 2002), Standard Practice for Ultimate Analysis of Coal and Coke (incorporated by reference, see §98.7).
  - (vii) ASTM D3238-95 (Reapproved 2005), Standard Test Method for Calculation of Carbon Distribution and Structural Group Analysis of Petroleum Oils by the n-d-M Method (incorporated by reference, see §98.7).
  - (viii) ASTM D4057-06 Standard Practice for Manual Sampling of Petroleum and Petroleum Products (incorporated by reference, see §98.7).
  - (ix) ASTM D4177-95 (Reapproved 2005) Standard Practice for Automatic Sampling of Petroleum and Petroleum Products (incorporated by reference, see §98.7).
  - (x) ASTM D5291-02 (Reapproved 2007), Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants (incorporated by reference, see §98.7).
  - (xi) ASTM D5373-08 Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Laboratory Samples of Coal (incorporated by reference, see §98.7).
  - (xii) ASTM D6609-08 Standard Guide for Part-Stream Sampling of Coal (incorporated by reference, see §98.7).

- (xiii) ASTM D6883-04 Standard Practice for Manual Sampling of Stationary Coal from Railroad Cars, Barges, Trucks, or Stockpiles (incorporated by reference, see §98.7).
- (xiv) ASTM D7430-08ae1 Standard Practice for Mechanical Sampling of Coal (incorporated by reference, see §98.7).
- (xv) ASTM UOP539-97 Refinery Gas Analysis by Gas Chromatography (incorporated by reference, see §98.7).
- (xvi) GPA 2261–00 Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography (incorporated by reference, see §98.7).
- (xvii) ISO 3170: Petroleum Liquids -- Manual sampling – Third Edition (incorporated by reference, see §98.7).
- (xviii) ISO 3171: Petroleum Liquids -- Automatic pipeline sampling – Second Edition (incorporated by reference, see §98.7).

(c) For units using the calculation methodologies described in this section, the records required under §98.3(g) must include both the company records and a detailed explanation of how company records are used to estimate the following:

- (1) Fuel and feedstock consumption, when solid fuel and feedstock is combusted and a CEMS is not used to measure GHG emissions.
- (2) Fossil fuel consumption, when, pursuant to §98.33(e), the owner or operator of a unit that uses CEMS to quantify CO<sub>2</sub> emissions and that combusts both fossil and biogenic fuels separately reports the biogenic portion of the total annual CO<sub>2</sub> emissions.
- (3) Sorbent usage, if the methodology in §98.33(d) is used to calculate CO<sub>2</sub> emissions from sorbent.

(d) The owner or operator must document the procedures used to ensure the accuracy of the estimates of fuel and feedstock usage and sorbent usage (as applicable) in paragraph (b) of this section, including, but not limited to, calibration of weighing equipment, fuel and feedstock flow meters, and other measurement devices. The estimated accuracy of measurements made with these devices must also be recorded, and the technical basis for these estimates must be provided.

#### **§98.165 Procedures for estimating missing data.**

A complete record of all measured parameters used in the GHG emissions calculations is required. Therefore, whenever a quality-assured value of a required parameter is unavailable (e.g., if a meter malfunctions during unit operation), a substitute data value for the missing parameter must be used in the calculations as specified in paragraphs (a), (b), and (c) of this section:

(a) For each missing value of the monthly fuel and feedstock consumption, the substitute data value must be the best available estimate of the fuel and feedstock consumption, based on all available process data (e.g., hydrogen production, electrical load, and operating hours). You must document and keep records of the procedures used for all such estimates.

(b) For each missing value of the carbon content or molecular weight of the fuel and feedstock, the substitute data value must be the arithmetic average of the quality-assured values of carbon contents or molecular weight of the fuel and feedstock immediately preceding and immediately following the missing data incident. If no quality-assured data on carbon contents or molecular weight of the fuel and feedstock are available prior to the missing data incident, the substitute data value must be the first quality-assured value for carbon contents or molecular weight of the fuel and feedstock obtained after the missing data period. You must document and keep records of the procedures used for all such estimates.

(c) For missing CEMS data, you must use the missing data procedures in §98.35.

**§98.166 Data reporting requirements.**

In addition to the information required by §98.3(c), each annual report must contain the information specified in paragraphs (a) or (b) of this section, as appropriate, and paragraphs (c) and (d) of this section:

(a) If a CEMS is used to measure CO<sub>2</sub> emissions, then you must report the relevant information required under §98.36 for the Tier 4 Calculation Methodology and the following information in this paragraph (a):

- (1) Unit identification number and annual CO<sub>2</sub> emissions.
- (2) Annual quantity of hydrogen produced (metric tons) for each process unit and for all units combined.
- (3) Annual quantity of ammonia produced (metric tons), if applicable, for each process unit and for all units combined.

(b) If a CEMS is not used to measure CO<sub>2</sub> emissions, then you must report the following information for each hydrogen production process unit:

- (1) Unit identification number and CO<sub>2</sub> process emissions.
- (2) Monthly consumption of each fuel and feedstock used for hydrogen production and its type (scf of gaseous fuels and feedstocks, gallons of liquid fuels and feedstocks, kg of solid fuels and feedstocks).
- (3) Annual quantity of hydrogen produced (metric tons).
- (4) Annual quantity of ammonia produced, if applicable (metric tons).
- (5) Monthly analyses of carbon content for each fuel and feedstock used in hydrogen production (kg carbon/kg of gaseous and solid fuels and feedstocks, (kg carbon per gallon of liquid fuels and feedstocks).
- (6) Monthly analyses of the molecular weight of gaseous fuels and feedstocks (kg/kg-mole) used, if any.

(c) Quantity of CO<sub>2</sub> collected and transferred off site in either gas, liquid, or solid forms, following the requirements of subpart PP of this part.

(d) Annual quantity of carbon other than CO<sub>2</sub> collected and transferred off site in either gas, liquid, or solid forms (kg carbon).

**§98.167 Records that must be retained.**

In addition to the information required by §98.3(g), you must retain the records specified in paragraphs (a) through (b) of this section for each hydrogen production facility.

(a) If a CEMS is used to measure CO<sub>2</sub> emissions, then you must retain under this subpart the records required for the Tier 4 Calculation Methodology in §98.37.

(b) If a CEMS is not used to measure CO<sub>2</sub> emissions, then you must retain records of all analyses and calculations conducted as listed in §§98.166(b), (c), and (d).

**§98.168 Definitions.**

All terms used in this subpart have the same meaning given in the Clean Air Act and subpart A of this part.