Hydrogen Producer Reporting Guidance
for California’s Mandatory GHG Reporting Program

Introduction

This document provides guidance to California hydrogen producers for the reporting required by the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (title 17, California Code of Regulations, section 95100 et seq.) (MRR), including information on changes to MRR for hydrogen producers and instructions on submitting production and emissions data in Subpart P of the California Electronic Greenhouse Gas Reporting Tool (Cal e-GGRT). This guidance applies to 2017 data reported in 2018, and subsequent years, for both merchant hydrogen plants and refineries that produce hydrogen.

For additional information about product data reporting, including the requirement to exclude inaccurate product data, the use of financial transaction meters, how product data are evaluated during verification for accuracy and conformance with the regulation, and other topics, please refer to the Covered Product Data General Reporting and Verification Guidance document.

This guidance document describes the requirements of MRR. Unlike MRR, this guidance does not have the force of law, does not establish new mandatory requirements for greenhouse gas (GHG) reporting, and in no way supplants, replaces, or amends any of the legal requirements of the Regulation. Conversely, an omission or truncation of regulatory requirements in this guidance does not relieve operators of their legal obligation to fully comply with all requirements of MRR.

The current document contains revisions to clarify the following changes resulting from MRR amendments that go into effect for 2018 data reported in 2019:

- Operators must report hydrogen sold or transferred to individual petroleum refineries and hydrogen vehicle fueling stations (section 1.5); and
- Operators must report the annual quantity of gaseous hydrogen sold or transferred and annual quantity of liquid hydrogen sold or transferred to individual facilities (section 2.5).
1 Product Data Reporting

This section provides details for reporting product data and other facility-level data in the “Other Facility Reporting Information” section of Subpart P of Cal e-GGRT (depicted in Figure 1).

Figure 1. Subpart P, “Other Facility Reporting Information” (top half)

1.1 Definitions for Reporting Product Data

Section 95102(b) of MRR defines by-product hydrogen gas, liquid hydrogen, and on-purpose hydrogen gas as follows:

- ‘By-product hydrogen gas’ means pure hydrogen gas produced as a result of a process or processes dedicated to producing other products (e.g. catalytic reforming).
- ‘Liquid Hydrogen’ means hydrogen in a liquid state.
- ‘On-purpose hydrogen gas’ means pure molecular hydrogen gas produced by a process or processes dedicated to producing hydrogen (e.g., steam methane reforming).
Because the reported annual masses of on-purpose hydrogen gas produced and liquid hydrogen sold are used to allocate allowances in the Cap-and-Trade Regulation, these values are covered product data and are subject to material misstatement assessment during the verification process. Reporting the annual mass of by-product hydrogen gas produced is required, but these data are not covered product data and are not subject to material misstatement assessment.

On-purpose hydrogen gas production and liquid hydrogen production are classified by the North American Industrial Classification System (NAICS) as Industrial Gas Manufacturing (NAICS code 325120). Facility operators must report this NAICS code in the general facility information reporting in Subpart A of Cal e-GGRT to qualify for allowance allocation for hydrogen production under the Cap-and-Trade Program. Petroleum refineries that also produce hydrogen must report the code for Industrial Gas Manufacturing as a secondary NAICS code in Subpart A.

### 1.2 Annual Mass of On-Purpose Hydrogen Gas Produced

Section 95114(j) of MRR requires facility operators to report the annual mass (metric tons) of on-purpose hydrogen gas produced. This mass produced must be reported in the “Annual mass of on-purpose hydrogen gas produced (covered product data)” field in the "Other Facility Reporting Info" page of Subpart P in Cal e-GGRT, shown in Figure 1. The reported mass of on-purpose hydrogen gas must reflect actual on-site production, not sales.

Molecular hydrogen (H₂) in the feedstock to the hydrogen production unit (e.g., steam methane reformer) that passed through the production unit should be included in the annual mass of on-purpose hydrogen gas produced, but any molecular hydrogen sent to the hydrogen purification unit after bypassing the hydrogen production unit must be excluded. Chemicals other than molecular hydrogen (i.e., impurities, such as CH₄ or steam) also must be excluded from the reported annual mass of on-purpose hydrogen gas produced. Any produced hydrogen gas that is later used to make liquid hydrogen must also be excluded from the annual mass of on-purpose hydrogen gas produced.

### 1.3 Annual Mass of By-Product Hydrogen Gas Produced

Section 95114(j) of MRR requires facility operators to report the annual mass (metric tons) of by-product hydrogen gas produced. This mass produced must be calculated and reported in the “Annual mass of by-product hydrogen gas produced” field in the “Other Facility Reporting Info” page of Subpart P in Cal e-GGRT, shown in Figure 1. The reported mass must be pure molecular hydrogen gas (H₂), and chemicals other than molecular hydrogen (i.e., impurities, such as CH₄ or steam) must be excluded.
1.4 Annual Mass of Liquid Hydrogen Sold

The annual mass of liquid hydrogen sold to other entities must be reported in the “Annual mass of liquid hydrogen sold (covered product data)” field in the “Other Facility Reporting Info” page of Subpart P in Cal e-GGRT. The reported mass of liquid hydrogen sold may be determined directly from annual sales records.

1.5 All Hydrogen Sold or Transferred to Petroleum Refineries and Hydrogen Vehicle Fueling Stations

Pursuant to section 95114(j), facility operators must report the annual mass (metric tons) of all gaseous and liquid hydrogen sold or otherwise transferred to petroleum refineries and hydrogen vehicle fueling stations in the “Other Facility Reporting Info” page of Subpart P in Cal e-GGRT. Beginning with 2018 data reported in 2019, facility operators must separately report the mass of gaseous hydrogen transferred and mass of liquid hydrogen transferred, as well as continue to report the combined total.

2 Emissions Data Reporting

This section provides guidance on the emissions data reporting required for hydrogen producers pursuant to section 95114 of MRR. Operators report both facility-level and unit-level emissions data associated with hydrogen production in Subpart P of Cal e-GGRT. Only the unit-level emissions, flaring emissions, and de minimis emissions are used by Cal e-GGRT to calculate the facility’s Subpart P covered emissions.

2.1 CO₂ Captured and Transferred Off-Site

Hydrogen production facilities that capture CO₂ and transfer it off-site must report these emissions in Subpart PP of Cal e-GGRT, as specified in section 95123, as well as in Subpart P of Cal e-GGRT, as specified in section 95114(i). This data is reported in Subpart P at both the facility level and unit level. At the facility level, the annual mass of CO₂ transferred off-site must be reported in the “Annual mass of all CO₂ captured, transferred off-site, and reported by the hydrogen production facility as a supplier of CO₂ as described in section 95114(i)” field in the “Other Facility Reporting Info” page of Subpart P in Cal e-GGRT, shown in Figure 2.

At the unit level, CO₂ captured and transferred off-site is reported in the Equation P-1 calculation spreadsheet as part of the S Factor. The value entered for the S Factor is calculated by the reporter and entered into the Equation P-1 spreadsheet under “S Factor.” CO₂ emissions reported under the S Factor are subtracted from unit-level CO₂ emissions in the Equation P spreadsheet. Cal e-GGRT uses the adjusted unit-level CO₂ emissions to calculate total Subpart P covered emissions. Thus, although CO₂
transferred off-site is also reported in Subpart PP, double counting does not occur because these emissions are subtracted out of Subpart P emissions via the S Factor. The Equation P-1 calculation spreadsheet and S factor are discussed further in sections 2.5 and 2.6, respectively. Note that the facility-level mass of CO₂ captured and transferred off-site that is reported in the Other Facility Reporting Info page should equal the total mass of CO₂ that is reported at the unit level as part of an S Factor. This internal data check may be part of the verification process.

2.2 Transferred Carbon other than CO₂

The annual mass of carbon other than CO₂ that is transferred off-site in gas, liquid, or solid form must be reported in the data field “Annual quantity of carbon, other than CO₂, collected and transferred off site in either gas, liquid or solid forms,” in the Other Facility Reporting Info page of Subpart P in Cal e-GGRT, shown in Figure 2. This requirement is included in Title 40, Code of Federal Regulation, section 98.166(d) of the U.S. EPA reporting rule, which is incorporated by MRR in the initial paragraph of section 95114.

2.3 Emissions Reported Elsewhere

Pursuant to section 95114(g), operators are required to report in Subpart P the masses of CO₂ and CH₄ reported both in the Equation P spreadsheet and elsewhere in Cal e-GGRT (i.e., “emissions reported elsewhere”).

Operators report “emissions reported elsewhere” in Subpart P at both the facility level and unit level. At the facility level, the annual mass of CO₂ and CH₄ reported outside of the Equation P spreadsheet in Cal e-GGRT must be reported in the data fields “Amount of carbon dioxide calculated and reported using other methods in the regulation [95114(g)]” and “Amount of methane calculated and reported using other methods in the regulation [95114(g)]”, respectively, as shown in Figure 2.

At the unit level, emissions reported elsewhere are reported in the Equation P calculation spreadsheet as part of the S factor. As described in section 2.1 above, emissions reported as part of the S factor are subtracted from the unit-level CO₂ emissions calculated in the Equation P spreadsheet, which are then used by Cal e-GGRT to calculate total Subpart P covered emissions. Thus, the S factor is used to avoid double counting of any emissions that may be reported both in the Equation P spreadsheet and elsewhere in Cal e-GGRT.

An example of when emissions may be reported elsewhere is if CO₂ and CH₄ is emitted in a waste stream from a hydrogen production unit (e.g., an off-gas stream from a pressure swing absorption [PSA] unit). The CO₂ and CH₄ emissions are calculated as emissions from the hydrogen production unit by Equation P-1, but the CO₂ and CH₄
may also be calculated and reported as flaring or other combustion emissions within Subpart C of Cal e-GGRT, or as flaring emissions under Subpart P or Y. Because these emissions actually occur through flaring or other combustion, they must be reported as such in the appropriate subpart and subtracted from unit-level emissions calculated in the Equation P-1 spreadsheet by reporting them as part of the S Factor.

Note that the facility-level mass of CO₂ and CH₄ emissions reported elsewhere that are reported in the “Other Facility Reporting Info” page should equal the total mass of emissions reported elsewhere that are reported at the unit level as part of an S Factor. This internal data check may be part of the verification process.

2.4 CO₂e Emissions from Refinery Fuel Gas for the Cost of Implementation (COI) Fee Regulation

For merchant hydrogen facilities that are not operated by refineries, the total CO₂e emissions (in metric tons) from the combustion and/or consumption of refinery fuel gas as a fuel or a feedstock must be reported as shown in the last data entry box in Figure 2. Emissions from the combustion/consumption of purchased pipeline natural gas should be excluded from the total CO₂e emissions reported in this field. The emissions reported in this field are used for the COI Fee Regulation only and do not affect the calculation of the facility’s covered emissions.

2.5 Atomic Carbon Content, Atomic Hydrogen Content, Molecular Hydrogen Content, and Molecular Weight of Feedstocks and Fuels

The atomic carbon content, atomic hydrogen content, and molecular hydrogen content of all feedstocks to a hydrogen production unit must be reported pursuant to sections 95114(e)(1) and 95114(e)(2). For units not monitored by a CEMS, the operator must additionally report the carbon content of all fuels and the molecular weight of all gaseous fuels and feedstocks. Fuel and feedstock data are reported in Equation P spreadsheets. Data for each gaseous feedstock or fuel utilized by a hydrogen production unit are reported in an Equation P-1 spreadsheet; data for each liquid feedstock or fuel are reported in an Equation P-2 spreadsheet; and data for each solid feedstock or fuel are reported in an Equation P-3 spreadsheet. All of the spreadsheets are available at the Cal e-GGRT Calculation Spreadsheet Instructions website.
Figure 2. Subpart P, “Other Facility Reporting Information” (bottom half)

<table>
<thead>
<tr>
<th>Purchaser of Hydrogen</th>
<th>ARB ID (if available)</th>
<th>Annual Quantity of Total Gaseous and Liquid Hydrogen Sold or Transferred (MT)</th>
<th>Annual Quantity of Gaseous Hydrogen Sold or Transferred (MT)</th>
<th>Annual Quantity of Liquid Hydrogen Sold or Transferred (MT)</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>No records have been added</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Annual mass of all CO₂ captured, transferred off-site, and reported by the hydrogen production facility as a supplier of CO₂ as described in section 85114(i)**:
  - **(metric tons)**

- **Annual quantity of carbon, other than CO₂, collected and transferred off site in either gas, liquid or solid forms**:
  - **(kg carbon)**

- **Amount of carbon dioxide calculated and reported using other methods in the regulation [85114(q)]**:
  - **(metric tons)**

- **Amount of methane calculated and reported using other methods in the regulation [85114(q)]**:
  - **(metric tons)**

**COST OF IMPLEMENTATION (COI) FEES DATA; REFINERY FUEL GAS [SECTION 95204(F)(5) - COI REGULATION]**

For Merchant Hydrogen facilities only, enter the CO₂e emissions for all refinery fuel gas combusted or consumed at the facility. Do not include emissions from pipeline quality natural gas combustion (see section 95204(f)(5) for removing the natural gas). The emissions entered in this field are not included in any facility total emissions and are only used for fees calculations. Therefore, all combustion emissions must also be reported in Subpart C.

Refineries with integrated hydrogen production do not complete this section and should leave it blank. For refineries, the COI refinery fuel gas facility emissions are entered in the Subpart Y Additional Production Data and Solomon energy intensity index workbook.

- **Emissions from Refinery fuel gas Combusted or Consumed On-Site for Merchant Hydrogen Facility (excluding natural gas)**:
  - **(metric tons CO₂e)**

*Merchant hydrogen facilities only; not to be completed by refineries
**Emissions value is NOT included in emissions totals for GHG report; COI use only

Figure 3 shows a screenshot of the Equation P-1 spreadsheet. For each gaseous fuel or feedstock supplied to a hydrogen production unit, the atomic carbon content, atomic hydrogen content, molecular hydrogen content, and/or molecular weight must be reported in the appropriate column of the Equation P-1 spreadsheet for each month of the year. Pipeline quality natural gas from a utility may be assumed to have a molecular hydrogen content equal to zero.
The atomic carbon content of the hydrogen production unit feedstock means the monthly weighted average mass fraction of carbon atoms in the total feedstock introduced to the hydrogen production unit. This includes carbon atoms that are part of molecules such as CH₄ or CO₂ contained in the feedstock. Similarly, the atomic hydrogen content of a feedstock means the monthly average mass fraction of hydrogen atoms in the total feedstock introduced to the hydrogen production unit. This includes hydrogen atoms that are part of molecular hydrogen (H₂) contained in the feedstock, but it excludes hydrogen atoms in steam (H₂O). Steam is not considered to be a hydrogen production unit feedstock in these calculations.
The monthly average molecular hydrogen content of the total feedstock to the hydrogen production unit must also be reported for each month. The molecular hydrogen content of a feedstock means the monthly average mass fraction of hydrogen molecules (H₂) in the total feedstock introduced to the hydrogen production unit.

For operators with CEMS on the hydrogen production unit, the Equation P-1, P-2, or P-3 spreadsheets are not required for estimating CO₂ emissions. However, the appropriate Equation P-1, P-2, or P-3 spreadsheet(s) must be uploaded to Subpart A of Cal e-GGRT under “Additional Attachments” to report the monthly average atomic carbon content, atomic hydrogen content, and molecular hydrogen content of each feedstock.

2.6 Unit-Level Emissions

For hydrogen production units not monitored by a CEMS, operators use the Equation P spreadsheets to calculate and report CO₂ process and fuel combustion emissions. CO₂ emissions are calculated using Equations P-1, 2, or 3 for gaseous, liquid, and solid fuels and feedstocks, respectively. The equations utilize monthly fuel volume and carbon content, as well as molecular weight for gaseous fuels or feedstocks, to estimate CO₂ emissions. The equations assume that all carbon content in the fuel or feedstock is converted to CO₂. Multiple Equation P spreadsheets may be completed for each hydrogen production unit, as a separate spreadsheet is required for each fuel or feedstock.

2.7 S Factor for CO₂ Emissions Reported Elsewhere and CO₂ Captured and Transferred Off-site

As discussed in sections 2.1 and 2.3 above, the S Factor in the Equation P spreadsheets is equal to the mass of CO₂ that is captured and transferred off-site and/or the mass of CO₂ emissions reported elsewhere. It is used to avoid double-counting of CO₂ emissions that are captured and transferred off-site, which are also reported under Subpart PP, and to avoid double-counting of emissions that are reported both in the Equation P spreadsheet and elsewhere in Cal e-GGRT. The S Factor is deducted from the total CO₂ emissions calculated for the unit in the Equation P spreadsheet. The emissions calculated in the Equation P spreadsheets are used to calculate total Subpart P emissions, which in turn are used to calculate total facility emissions. So if the S Factor is used as intended, no further adjustments in Cal e-GGRT are needed to avoid double counting of emissions that are captured and transferred off-site or that are reported elsewhere in Cal e-GGRT.

In cases where CO₂ transferred off-site or reported elsewhere cannot be attributed to a single hydrogen unit, those emissions must still be subtracted from the facility total by
including them in an S Factor. The reporter may either attribute all of the CO₂ transferred or CO₂ emissions reported elsewhere to a single designated hydrogen unit (or even a specific fuel or feedstock), in which case it would all be in one S factor, or the reporter may distribute the mass among the multiple units and fuels or feedstocks. The sum of all S factors equals the total amount of double-counted emissions that should be subtracted from facility-level emissions.

Note that the sum of all reported S Factors should equal the sum of the facility-level mass of CO₂ captured and transferred off-site (section 3.1) and the facility-level mass of CO₂ emissions reported elsewhere as reported in the “Other Facility Reporting Info” page of Subpart P. This internal data check may be part of the verification process.

The S Factor can only be used to correct Subpart P emissions for double counting when emissions from a hydrogen production unit are calculated using an Equation P calculation spreadsheet. If a CEMS and/or mass balance approach is used to calculate emissions from a hydrogen production unit, operators must use another method to ensure that emissions are not reported twice in Cal e-GGRT.

2.8 Stationary Combustion CH₄ and N₂O Emissions

Operators must report CH₄ and N₂O combustion emissions associated with hydrogen production pursuant to section 95114(k). If not included as part of reporting for a CEMS unit within Subpart P of Cal e-GGRT, these CH₄ and N₂O emissions must be reported as stationary source combustion emissions in Subpart C of Cal e-GGRT. The operator may add a new unit configuration to Subpart C to include the CH₄ and N₂O combustion emissions associated with hydrogen production activities. The CH₄ emissions reported under Subpart C are partially accounted for in the Equation P spreadsheet, which assumes all carbon entering the unit as fuel or feedstock is converted to CO₂. Therefore, the small amount of CH₄ from stationary combustion associated with hydrogen production that is reported under Subpart C may be accounted for in the S Factor in units of CO₂e.

The mass of CH₄ emissions that are included in the S Factor should equal the mass of CH₄ emissions reported elsewhere in the “Other Facility Reporting Info” page (see section 3.3 and Figure 2).

2.9 Flaring Emissions Associated with Hydrogen Production

Section 95114(l) of MRR requires hydrogen producers to report annual mass of CO₂, CH₄, and N₂O emissions from flaring. Merchant hydrogen production facilities must report these emissions under the flaring section of Subpart P within Cal e-GGRT. Refineries must report flaring emissions associated with hydrogen production under
Subpart P if these emissions can be disaggregated from flaring emissions associated with other refinery activities. If these emissions cannot be separated from flaring emissions associated with other refinery activities, then operators may report flaring emissions associated with hydrogen production in Subpart Y. Figure 4 shows the initial data entry screen to add a flare in Subpart P of Cal e-GGRT. Subsequent screens are displayed in Cal e-GGRT depending on the emissions calculation method that is selected for the flare.

**Figure 4. Subpart P, Flare Emissions**
3 Additional Information

Detailed training materials for reporting using Cal e-GGRT:
https://ww2.arb.ca.gov/mrr-tool

The GHG Mandatory Reporting Regulation, with full requirements:
https://ww2.arb.ca.gov/mrr-regulation

Contact the MRR reporting helpdesk: ghgreport@arb.ca.gov.

Contact the MRR verification helpdesk: ghgverify@arb.ca.gov.

For help with reporting or verification, please contact the appropriate staff member:
https://ww2.arb.ca.gov/mrr-contacts