



Verifier Accreditation Training for Mandatory GHG Reporting

Transactions Specialty – Course 2.4

Suppliers of Carbon Dioxide (CO₂)



MRR Verifier Accreditation: Course Content

- **Course 2: Transactions Specialty**
 - 2.1 Electric Power Entities
 - 2.2 Suppliers of Transportation Fuels
 - 2.3 Suppliers of Natural Gas, Natural Gas Liquids, Liquefied Petroleum Gas, CNG and LNG
 - 2.4 Suppliers of Carbon Dioxide (CO₂)

Suppliers of Carbon Dioxide (CO₂) (§95123)

1. Applicability
2. Types of CO₂ Emissions Reported
3. Emissions Calculation
4. Verification
5. Case Study

Applicability

- All producers of (supplied) carbon dioxide without regard to quantity produced, and
- California importers and exporters of $\geq 10,000$ MT CO₂ (§95101(c)(9))
- CO₂ suppliers can combine with other reports (unlike other suppliers who report separately)

On-site use of the CO₂ recovered from a process is not covered by §95123.

Types of CO₂ Emissions Reported

- Mass of CO₂ captured from production process units
- Mass of CO₂ extracted from CO₂ production wells
- Mass of CO₂ imported and exported
 - Exports for purposes of geologic sequestration must be reported separately from exports for other purposes

Calculation of CO₂ Emissions

- Emissions calculated using equations in 40 CFR 98.423 subpart PP using meters that measure either:
 - Mass
 - At least quarterly CO₂ (wt %) composition data
 - Volume
 - At least quarterly CO₂ (wt % or vol%) composition data
 - At least quarterly density measurement
 - MTCO₂/scm for wt%
 - MT/scm for vol%

Calculation of CO₂ Emissions (mass meter)

- Mass meters measure the mass of CO₂. Calculation depends on mass of flow gas, and measured concentration of CO₂.
- To calculate emissions from supplied CO₂ measured by a mass flow meter, use subpart PP 40 CFR 98.423(a)(1)

$$\sum_{p=1}^4 Q_{p,u} * C_{CO_2,p,u} \quad (\text{Eq. PP-1})$$

$C_{CO_2,p,u}$ = Quarterly CO₂ concentration measurement (wt. %CO₂)

$Q_{p,u}$ = mass flow rate measurement for flow meter u in quarter p
(metric tons)

- Mass of CO₂ is calculated by quarter, then summed

Calculation of CO₂ Emissions (volume meter)

- Volume meters measure the volume of CO₂. Calculation depends on volume of flowed gas, DENSITY and measured concentration of CO₂.
- Emissions calculated using equations in subpart PP 40 CFR 98.423(a)(2)

$$\sum_{p=1}^4 Q_p * D_p * C_{CO_2,p} \quad (\text{Eq. PP-2})$$

Q_p = volumetric flow rate measurement in standard cubic meters

D_p = Density of CO₂ in MT of CO₂/scm if $C_{CO_2,p}$ is measured in vol%
or density of the whole CO₂ stream in MT/scm if $C_{CO_2,p}$ is
measured as wt% CO₂

$C_{CO_2,p}$ = CO₂ concentration measurement as either vol% CO₂
or wt% CO₂

- Mass of CO₂ is calculated by quarter, then summed

Verification of CO₂ Emissions

- Verification
 - Ensure completeness of data
 - Ensure data are accurately measured, compiled and entered
 - Ask about meter location and concentration measurement location to ensure reported data matches actual CO₂ supplied
 - May be able to do quick review of sales records
 - If CO₂ is captured from H₂ production process, these emissions must be subtracted from Subpart P emissions (§95114(i), covered in more detail in Course 3)

Case Study

CO₂ Reported Under Subpart P and PP

- Calculate the CO₂ reported under Subparts P and PP for a CO₂ supplier given the following information:
- The hydrogen production unit at a refinery produces 85,000 MTCO₂
 - The refinery captures some CO₂ generated from hydrogen production and provides the following annual data:
20,000,000 scm capture, 0.00183 MT/scm, 97% CO₂ concentration by weight
- What is the amount of CO₂ reported under Subpart PP as CO₂ supplied and what are the emissions reported under subpart P as hydrogen production unit emissions?

Case Study - Solution

CO₂ Reported Under Subpart P and PP

- Calculate the CO₂ reported under Subpart PP for a CO₂ supplier:

- Answer:
$$\sum_{p=1}^4 Q_p * D_p * C_{CO_2,p} \quad (\text{Eq. PP-2})$$

$$20,000,000 \text{ scm} * .00183 \text{ MTCO}_2/\text{scm} * 97\% \text{ CO}_2 = 35,502 \text{ MTCO}_2 \text{ reported under PP}$$

- $85,000 \text{ MTCO}_2 - 35,502 \text{ MTCO}_2 = \underline{49,498 \text{ MT CO}_2}$ reported under subpart P

Course 2: Transactions

Complete:

- Course 2.1: Electric Power Entities (EPE)
- Course 2.2: Suppliers of Transportation Fuels
- Course 2.3: Suppliers of Natural Gas, Natural Gas Liquids & Liquefied Petroleum Gas
- Course 2.4: Suppliers of CO₂