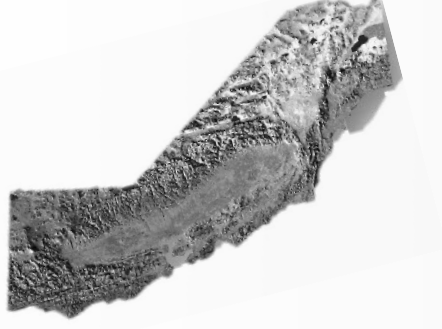


## Verifier Accreditation Training for Mandatory GHG Reporting

### Transactions Specialty – Course 2.4

Suppliers of Carbon Dioxide (CO<sub>2</sub>)



## MRR Verifier Accreditation: Course Content

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- **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 (CO<sub>2</sub>)

2

## Suppliers of Carbon Dioxide (CO<sub>2</sub>) (§95123)

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1. Applicability
2. Types of CO<sub>2</sub> Emissions Reported
3. Emissions Calculation
4. Verification
5. Case Study

## Applicability

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- All producers of (supplied) carbon dioxide without regard to quantity produced, and
- California importers and exporters of ≥ 10,000 MT CO<sub>2</sub> (§95101(c)(9))
- CO<sub>2</sub> suppliers can combine with other reports (unlike other suppliers who report separately)

*On-site use of the CO<sub>2</sub> recovered from a process is not covered by § 95123.*

3

## Types of CO<sub>2</sub> Emissions Reported

- Mass of CO<sub>2</sub> captured from production process units
- Mass of CO<sub>2</sub> extracted from CO<sub>2</sub> production wells
- Mass of CO<sub>2</sub> imported and exported
  - Exports for purposes of geologic sequestration must be reported separately from exports for other purposes

5

## Calculation of CO<sub>2</sub> Emissions (mass meter)

- Mass meters measure the mass of CO<sub>2</sub>. Calculation depends on mass of flow gas, and measured concentration of CO<sub>2</sub>.
- To calculate emissions from supplied CO<sub>2</sub> 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 CO<sub>2</sub> concentration measurement (wt. %CO<sub>2</sub>)  
 $Q_{p,u}$  = mass flow rate measurement for flow meter u in quarter p (metric tons)

- Mass of CO<sub>2</sub> is calculated by quarter, then summed

7

## Calculation of CO<sub>2</sub> Emissions

- Emissions calculated using equations in 40 CFR 98.423 subpart PP using meters that measure either:
  - Mass
    - At least quarterly CO<sub>2</sub> (wt %) composition data
  - Volume
    - At least quarterly CO<sub>2</sub> (wt % or vol%) composition data
    - At least quarterly density measurement
      - MTCO<sub>2</sub>/scm for wt%
      - MT/scm for vol%

6

## Calculation of CO<sub>2</sub> Emissions (volume meter)

- Volume meters measure the volume of CO<sub>2</sub>. Calculation depends on volume of flowed gas, DENSITY and measured concentration of CO<sub>2</sub>.
- 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 CO<sub>2</sub> in MT of CO<sub>2</sub>/scm if  $C_{CO_2,p}$  is measured in vol% or density of the whole CO<sub>2</sub> stream in MT/scm if  $C_{CO_2,p}$  is measured as wt% CO<sub>2</sub>  
 $C_{CO_2,p}$  = CO<sub>2</sub> concentration measurement as either vol% CO<sub>2</sub> or wt% CO<sub>2</sub>

- Mass of CO<sub>2</sub> is calculated by quarter, then summed

8

## Verification of CO<sub>2</sub> 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 CO<sub>2</sub> supplied
  - May be able to do quick review of sales records
  - If CO<sub>2</sub> is captured from H<sub>2</sub> production process, these emissions must be subtracted from Subpart P emissions (§95114(j), covered in more detail in Course 3)

9

## Case Study

### CO<sub>2</sub> Reported Under Subpart P and PP

- Calculate the CO<sub>2</sub> reported under Subparts P and PP for a CO<sub>2</sub> supplier given the following information:
  - The hydrogen production unit at a refinery produces 85,000 MTCO<sub>2</sub>
    - The refinery captures some CO<sub>2</sub> generated from hydrogen production and provides the following annual data:  
20,000,000 scm capture, 0.00183 MT/scm, 97% CO<sub>2</sub> concentration by weight
  - What is the amount of CO<sub>2</sub> reported under Subpart PP as CO<sub>2</sub> supplied and what are the emissions reported under subpart P as hydrogen production unit emissions?

10

## Case Study - Solution

### CO<sub>2</sub> Reported Under Subpart P and PP

- Calculate the CO<sub>2</sub> reported under Subpart PP for a CO<sub>2</sub> supplier:
  - Answer: 
$$\sum_{p=1}^4 Q_p * D_p * C_{CO_2,p} \quad (\text{Eq. PP-2})$$
  
20,000,000 scm \* .00183 MTCO<sub>2</sub>/scm \* 97% CO<sub>2</sub> =  
35,502 MTCO<sub>2</sub> reported under PP
    - 85,000 MTCO<sub>2</sub> - 35,502 MTCO<sub>2</sub> = 49,498 MT CO<sub>2</sub>  
reported under subpart P

11

## 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 CO<sub>2</sub>