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where:

- CO<sub>2</sub> = Total annual CO<sub>2</sub> mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.
- CO<sub>2I</sub> = Total annual CO<sub>2</sub> mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.
- CO<sub>2P</sub> = Total annual CO<sub>2</sub> mass produced (metric tons) in the reporting year.
- CO<sub>2E</sub> = Total annual CO<sub>2</sub> mass emitted (metric tons) by surface leakage in the reporting year.
- CO<sub>2FI</sub> = Total annual CO<sub>2</sub> mass emitted (metric tons) from equipment leaks and vented emissions of CO<sub>2</sub> from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead, for

- which a calculation procedure is provided in subpart W of this part.
- CO<sub>2FP</sub> = Total annual CO<sub>2</sub> mass emitted (metric tons) from equipment leaks and vented emissions of CO<sub>2</sub> from equipment located on the surface between the production wellhead and the flow meter used to measure production quantity, for which a calculation procedure is provided in subpart W of this part.

(2) If you are not actively producing oil or natural gas or any other fluids, you must calculate the annual mass of CO<sub>2</sub> that is sequestered in subsurface geologic formations in the reporting year in accordance with the procedures specified in Equation RR-12 of this section.

$$CO_2 = CO_{2I} - CO_{2E} - CO_{2FI} \quad (\text{Eq. RR-12})$$

where:

- CO<sub>2</sub> = Total annual CO<sub>2</sub> mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.
- CO<sub>2I</sub> = Total annual CO<sub>2</sub> mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.
- CO<sub>2E</sub> = Total annual CO<sub>2</sub> mass emitted (metric tons) by surface leakage in the reporting year.
- CO<sub>2FI</sub> = Total annual CO<sub>2</sub> mass emitted (metric tons) from equipment leaks and vented emissions of CO<sub>2</sub> from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

[75 FR 75078, Dec. 1, 2010, as amended at 76 FR 73906, Nov. 29, 2011]

**§ 98.444 Monitoring and QA/QC requirements.**

(a) *CO<sub>2</sub> received.*

(1) Except as provided in paragraph (a)(4) of this section, you must determine the quarterly flow rate of CO<sub>2</sub> received by pipeline by following the most appropriate of the following procedures:

- (i) You may measure flow rate at the receiving custody transfer meter prior to any subsequent processing operations at the facility and collect the flow rate quarterly.
- (ii) If you took ownership of the CO<sub>2</sub> in a commercial transaction, you may

use the quarterly flow rate data from the sales contract if it is a one-time transaction or from invoices or manifests if it is an ongoing commercial transaction with discrete shipments.

(iii) If you inject CO<sub>2</sub> received from a production process unit that is part of your facility, you may use the quarterly CO<sub>2</sub> flow rate that was measured at the equivalent of a custody transfer meter following procedures provided in subpart PP of this part. To be the equivalent of a custody transfer meter, a meter must measure the flow of CO<sub>2</sub> being transported to an injection well to the same degree of accuracy as a meter used for commercial transactions.

(2) Except as provided in paragraph (a)(4) of this section, you must determine the quarterly mass or volume of contents in all containers if you receive CO<sub>2</sub> in containers by following the most appropriate of the following procedures:

- (i) You may measure the mass of contents of containers summed quarterly using weigh bills, scales, or load cells.
- (ii) You may determine the volume of the contents of containers summed quarterly.
- (iii) If you took ownership of the CO<sub>2</sub> in a commercial transaction, you may use the quarterly mass or volume of contents from the sales contract if it is

a one-time transaction or from invoices or manifests if it is an ongoing commercial transaction with discrete shipments.

(3) Except as provided in paragraph (a)(4) of this section, you must determine a quarterly concentration of the CO<sub>2</sub> received that is representative of all CO<sub>2</sub> received in that quarter by following the most appropriate of the following procedures:

(i) You may sample the CO<sub>2</sub> stream at least once per quarter at the point of receipt and measure its CO<sub>2</sub> concentration.

(ii) If you took ownership of the CO<sub>2</sub> in a commercial transaction for which the sales contract was contingent on CO<sub>2</sub> concentration, and if the supplier of the CO<sub>2</sub> sampled the CO<sub>2</sub> stream in a quarter and measured its concentration per the sales contract terms, you may use the CO<sub>2</sub> concentration data from the sales contract for that quarter.

(iii) If you inject CO<sub>2</sub> from a production process unit that is part of your facility, you may report the quarterly CO<sub>2</sub> concentration of the CO<sub>2</sub> stream supplied that was measured following the procedures provided in subpart PP of this part.

(4) If the CO<sub>2</sub> you receive is wholly injected and is not mixed with any other supply of CO<sub>2</sub>, you may report the annual mass of CO<sub>2</sub> injected that you determined following the requirements under paragraph (b) of this section as the total annual mass of CO<sub>2</sub> received instead of using Equation RR-1 or RR-2 of this subpart to calculate CO<sub>2</sub> received.

(5) You must assume that the CO<sub>2</sub> you receive meets the definition of a CO<sub>2</sub> stream unless you can trace it through written records to a source other than a CO<sub>2</sub> stream.

(b) *CO<sub>2</sub> injected.*

(1) You must select a point or points of measurement at which the CO<sub>2</sub> stream(s) is representative of the CO<sub>2</sub> stream(s) being injected. You may use as the point or points of measurement the location(s) of the flow meter(s) used to comply with the flow monitoring and reporting provisions in your Underground Injection Control permit.

(2) You must measure flow rate of CO<sub>2</sub> injected with a flow meter and collect the flow rate quarterly.

(3) You must sample the injected CO<sub>2</sub> stream at least once per quarter immediately upstream or downstream of the flow meter used to measure flow rate of that CO<sub>2</sub> stream and measure the CO<sub>2</sub> concentration of the sample.

(c) *CO<sub>2</sub> produced.*

(1) The point of measurement for the quantity of CO<sub>2</sub> produced from oil or other fluid production wells is a flow meter directly downstream of each separator that sends a stream of gas into a recycle or end use system.

(2) You must sample the produced gas stream at least once per quarter immediately upstream or downstream of the flow meter used to measure flow rate of that gas stream and measure the CO<sub>2</sub> concentration of the sample.

(3) You must measure flow rate of gas produced with a flow meter and collect the flow rate quarterly.

(d) *CO<sub>2</sub> emissions from equipment leaks and vented emissions of CO<sub>2</sub>.* If you have equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead or between the flow meter used to measure production quantity and the production wellhead, you must follow the monitoring and QA/QC requirements specified in subpart W of this part for the equipment.

(e) *Measurement devices.*

(1) All flow meters must be operated continuously except as necessary for maintenance and calibration.

(2) You must calibrate all flow meters used to measure quantities reported in §98.446 according to the calibration and accuracy requirements in §98.3(i).

(3) You must operate all measurement devices according to one of the following. You may use an appropriate standard method published by a consensus-based standards organization if such a method exists or an industry standard practice. Consensus-based standards organizations include, but are not limited to, the following: ASTM International, the American National Standards Institute (ANSI), the American Gas Association (AGA), the

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American Society of Mechanical Engineers (ASME), the American Petroleum Institute (API), and the North American Energy Standards Board (NAESB).

(4) You must ensure that any flow meter calibrations performed are National Institute of Standards and Technology (NIST) traceable.

### (f) *General.*

(1) If you measure the concentration of any CO<sub>2</sub> quantity for reporting, you must measure according to one of the following. You may use an appropriate standard method published by a consensus-based standards organization if such a method exists or an industry standard practice.

(2) You must convert all measured volumes of CO<sub>2</sub> to the following standard industry temperature and pressure conditions for use in Equations RR-2, RR-5 and RR-8 of this subpart: Standard cubic meters at a temperature of 60 degrees Fahrenheit and at an absolute pressure of 1 atmosphere.

(3) For 2011, you may follow the provisions of § 98.3(d)(1) through (2) for best available monitoring methods only for parameters required by paragraphs (a) and (b) of § 98.443 rather than follow the monitoring requirements of paragraph (a) of this section. For purposes of this subpart, any reference to the year 2010 in § 98.3(d)(1) through (2) shall mean 2011.

[75 FR 75078, Dec. 1, 2010, as amended at 76 FR 73906, Nov. 29, 2011]

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

A complete record of all measured parameters used in the GHG quantities calculations is required. Whenever the monitoring procedures cannot be followed, you must use the following missing data procedures:

(a) A quarterly flow rate of CO<sub>2</sub> received that is missing must be estimated as follows:

(1) Another calculation methodology listed in § 98.444(a)(1) must be used if possible.

(2) If another method listed in § 98.444(a)(1) cannot be used, a quarterly flow rate value that is missing must be estimated using a representative flow rate value from the nearest previous time period.

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(b) A quarterly mass or volume of contents in containers received that is missing must be estimated as follows:

(1) Another calculation methodology listed in § 98.444(a)(2) must be used if possible.

(2) If another method listed in § 98.444(a)(2) cannot be used, a quarterly mass or volume value that is missing must be estimated using a representative mass or volume value from the nearest previous time period.

(c) A quarterly CO<sub>2</sub> concentration of a CO<sub>2</sub> stream received that is missing must be estimated as follows:

(1) Another calculation methodology listed in § 98.444(a)(3) must be used if possible.

(2) If another method listed in § 98.444(a)(3) cannot be used, a quarterly concentration value that is missing must be estimated using a representative concentration value from the nearest previous time period.

(d) A quarterly quantity of CO<sub>2</sub> injected that is missing must be estimated using a representative quantity of CO<sub>2</sub> injected from the nearest previous period of time at a similar injection pressure.

(e) For any values associated with CO<sub>2</sub> emissions from equipment leaks and vented emissions of CO<sub>2</sub> from surface equipment at the facility that are reported in this subpart, missing data estimation procedures should be followed in accordance with those specified in subpart W of this part.

(f) The quarterly quantity of CO<sub>2</sub> produced from subsurface geologic formations that is missing must be estimated using a representative quantity of CO<sub>2</sub> produced from the nearest previous period of time.

(g) You must estimate the mass of CO<sub>2</sub> emitted by surface leakage that is missing as required by your approved MRV plan.

(h) You must estimate other missing data as required by your approved MRV plan.

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### **§ 98.446 Data reporting requirements.**

In addition to the information required by § 98.3(c), report the information listed in this section.