

time after the well or group of wells is plugged and abandoned in accordance with applicable requirements.

(2) *Content of request.* A request for discontinuation of reporting must contain either paragraph (b)(2)(i) or (b)(2)(ii) of this section.

(i) For wells permitted as Class VI under the Underground Injection Control program, a copy of the applicable Underground Injection Control program Director's authorization of site closure.

(ii) For all other wells, and as an alternative for wells permitted as Class VI under the Underground Injection Control program, a demonstration that current monitoring and model(s) show that the injected CO₂ stream is not expected to migrate in the future in a manner likely to result in surface leakage.

(3) *Notification.* The Administrator will issue a final decision on the request to discontinue reporting within a reasonable time. Any appeal of the Administrator's final decision is subject to the provisions of part 78 of this chapter.

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You must report:

- (a) Mass of CO₂ received.
- (b) Mass of CO₂ injected into the subsurface.
- (c) Mass of CO₂ produced.
- (d) Mass of CO₂ emitted by surface leakage.
- (e) Mass of CO₂ emissions from equipment leaks and vented emissions of CO₂ from surface equipment located between the injection flow meter and the injection wellhead.
- (f) Mass of CO₂ emissions from equipment leaks and vented emissions of CO₂ from surface equipment located be-

tween the production flow meter and the production wellhead.

(g) Mass of CO₂ sequestered in subsurface geologic formations.

(h) Cumulative mass of CO₂ reported as sequestered in subsurface geologic formations in all years since the facility became subject to reporting requirements under this subpart.

[75 FR 75078, Dec. 1, 2010, as amended at 76 FR 73905, Nov. 29, 2011]

§ 98.443 Calculating CO₂ geologic sequestration.

You must calculate the mass of CO₂ received using CO₂ received equations (Equations RR-1 to RR-3 of this section), unless you follow the procedures in § 98.444(a)(4). You must calculate CO₂ sequestered using injection equations (Equations RR-4 to RR-6 of this section), production/recycling equations (Equations RR-7 to RR-9 of this section), surface leakage equations (Equation RR-10 of this section), and sequestration equations (Equations RR-11 and RR-12 of this section). For your first year of reporting, you must calculate CO₂ sequestered starting from the date set forth in your approved MRV plan.

(a) You must calculate and report the annual mass of CO₂ received by pipeline using the procedures in paragraphs (a)(1) or (a)(2) of this section and the procedures in paragraph (a)(3) of this section, if applicable.

(1) For a mass flow meter, you must calculate the total annual mass of CO₂ in a CO₂ stream received in metric tons by multiplying the mass flow by the CO₂ concentration in the flow, according to Equation RR-1 of this section. You must collect these data quarterly. Mass flow and concentration data measurements must be made in accordance with § 98.444.

$$CO_{2T,r} = \sum_{p=1}^4 (Q_{r,p} - S_{r,p}) * C_{CO_{2,p,r}} \quad (\text{Eq. RR-1})$$

where:
CO_{2T,r} = Net annual mass of CO₂ received through flow meter r (metric tons).

Q_{r,p} = Quarterly mass flow through a receiving flow meter r in quarter p (metric tons).

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$S_{r,p}$ = Quarterly mass flow through a receiving flow meter r that is redelivered to another facility without being injected into your well in quarter p (metric tons).
 $C_{CO_2,p,r}$ = Quarterly CO_2 concentration measurement in flow for flow meter r in quarter p (wt. percent CO_2 , expressed as a decimal fraction).
 p = Quarter of the year.
 r = Receiving flow meter.

of CO_2 in a CO_2 stream received in metric tons by multiplying the volumetric flow at standard conditions by the CO_2 concentration in the flow and the density of CO_2 at standard conditions, according to Equation RR-2 of this section. You must collect these data quarterly. Volumetric flow and concentration data measurements must be made in accordance with § 98.444.

(2) For a volumetric flow meter, you must calculate the total annual mass

$$CO_{2T,r} = \sum_{p=1}^4 (Q_{r,p} - S_{r,p}) * D * C_{CO_2,p,r} \quad (\text{Eq. RR-2})$$

where:

$CO_{2T,r}$ = Net annual mass of CO_2 received through flow meter r (metric tons).
 $Q_{r,p}$ = Quarterly volumetric flow through a receiving flow meter r in quarter p at standard conditions (standard cubic meters).
 $S_{r,p}$ = Quarterly volumetric flow through a receiving flow meter r that is redelivered to another facility without being injected into your well in quarter p (standard cubic meters).
 D = Density of CO_2 at standard conditions (metric tons per standard cubic meter): 0.0018682.

$C_{CO_2,p,r}$ = Quarterly CO_2 concentration measurement in flow for flow meter r in quarter p (vol. percent CO_2 , expressed as a decimal fraction).
 p = Quarter of the year.
 r = Receiving flow meter.

(3) If you receive CO_2 through more than one flow meter, you must sum the mass of all CO_2 received in accordance with the procedure specified in Equation RR-3 of this section.

$$CO_2 = \sum_{r=1}^R CO_{2T,r} \quad (\text{Eq. RR-3})$$

where:

CO_2 = Total net annual mass of CO_2 received (metric tons).
 $CO_{2T,r}$ = Net annual mass of CO_2 received (metric tons) as calculated in Equation RR-1 or RR-2 for flow meter r .
 r = Receiving flow meter.

$CO_{2T,r}$ = Net annual mass of CO_2 received in containers r (metric tons).
 $C_{CO_2,p,r}$ = Quarterly CO_2 concentration measurement of contents in containers r in quarter p (wt. percent CO_2 , expressed as a decimal fraction).
 $Q_{r,p}$ = Quarterly mass of contents in containers r in quarter p (metric tons).
 $S_{r,p}$ = Quarterly mass of contents in containers r redelivered to another facility without being injected into your well in quarter p (metric tons).
 p = Quarter of the year.
 r = Containers.

(b) You must calculate and report the annual mass of CO_2 received in containers using the procedures in paragraphs (b)(1) or (b)(2) of this section.

(2) If you are measuring the volume of contents in a container under the provisions of § 98.444(a)(2)(ii), you must calculate the CO_2 received for injection in containers using Equation RR-2 of this section.

(1) If you are measuring the mass of contents in a container under the provisions of § 98.444(a)(2)(i), you must calculate the CO_2 received for injection in containers using Equation RR-1 of this section.

where:

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where:

- CO_{2T,r} = Net annual mass of CO₂ received in containers r (metric tons).
- C_{CO₂,p,r} = Quarterly CO₂ concentration measurement of contents in containers r in quarter p (vol. percent CO₂, expressed as a decimal fraction).
- Q_{r,p} = Quarterly volume of contents in containers r in quarter p (standard cubic meters).
- S_{r,p} = Quarterly mass of contents in containers r redelivered to another facility without being injected into your well in quarter p (metric tons).
- D = Density of the CO₂ received in containers at standard conditions (metric tons per standard cubic meter):0.0018682.
- p = Quarter of the year.

r = Containers.

(c) You must report the annual mass of CO₂ injected in accordance with the procedures specified in paragraphs (c)(1) through (c)(3) of this section.

(1) If you use a mass flow meter to measure the flow of an injected CO₂ stream, you must calculate annually the total mass of CO₂ (in metric tons) in the CO₂ stream injected each year in metric tons by multiplying the mass flow by the CO₂ concentration in the flow, according to Equation RR-4 of this section. Mass flow and concentration data measurements must be made in accordance with §98.444.

$$CO_{2,u} = \sum_{p=1}^4 Q_{p,u} * C_{CO_{2,p,u}} \quad (\text{Eq. RR-4})$$

where:

- CO_{2,u} = Annual CO₂ mass injected (metric tons) as measured by flow meter u.
- Q_{p,u} = Quarterly mass flow rate measurement for flow meter u in quarter p (metric tons per quarter).
- C_{CO₂,p,u} = Quarterly CO₂ concentration measurement in flow for flow meter u in quarter p (wt. percent CO₂, expressed as a decimal fraction).
- p = Quarter of the year.
- u = Flow meter.

(2) If you use a volumetric flow meter to measure the flow of an injected CO₂ stream, you must calculate annually the total mass of CO₂ (in metric tons) in the CO₂ stream injected each year in metric tons by multiplying the volumetric flow at standard conditions by the CO₂ concentration in the flow and the density of CO₂ at standard conditions, according to Equation RR-5 of this section. Volumetric flow and concentration data measurements must be made in accordance with §98.444.

$$CO_{2,u} = \sum_{p=1}^4 Q_{p,u} * D * C_{CO_{2,p,u}} \quad (\text{Eq. RR-5})$$

where:

- CO_{2,u} = Annual CO₂ mass injected (metric tons) as measured by flow meter u.
- Q_{p,u} = Quarterly volumetric flow rate measurement for flow meter u in quarter p at standard conditions (standard cubic meters per quarter).
- D = Density of CO₂ at standard conditions (metric tons per standard cubic meter): 0.0018682.
- C_{CO₂,p,u} = CO₂ concentration measurement in flow for flow meter u in quarter p (vol.

percent CO₂, expressed as a decimal fraction).

p = Quarter of the year.
u = Flow meter.

(3) To aggregate injection data for all wells covered under this subpart, you must sum the mass of all CO₂ injected through all injection wells in accordance with the procedure specified in Equation RR-6 of this section.

$$CO_{2I} = \sum_{u=1}^U CO_{2,u} \quad (\text{Eq. RR-6})$$

where:

CO_{2I} = Total annual CO₂ mass injected (metric tons) through all injection wells.
 CO_{2,u} = Annual CO₂ mass injected (metric tons) as measured by flow meter u.
 u = Flow meter.

(d) You must calculate the annual mass of CO₂ produced from oil or gas production wells or from other fluid wells for each separator that sends a stream of gas into a recycle or end use system in accordance with the procedures specified in paragraphs (d)(1) through (d)(3) of this section. You must account for any CO₂ that is produced and not processed through a separator. You must account only for wells that

produce the CO₂ that was injected into the well or wells covered by this source category.

(1) For each gas-liquid separator for which flow is measured using a mass flow meter, you must calculate annually the total mass of CO₂ produced from an oil or other fluid stream in metric tons that is separated from the fluid by multiplying the mass gas flow by the CO₂ concentration in the gas flow, according to Equation RR-7 of this section. You must collect these data quarterly. Mass flow and concentration data measurements must be made in accordance with §98.444.

$$CO_{2,w} = \sum_{p=1}^4 Q_{p,w} * C_{CO_{2,p,w}} \quad (\text{Eq. RR-7})$$

Where:

CO_{2,w} = Annual CO₂ mass produced (metric tons) through separator w.
 Q_{p,w} = Quarterly gas mass flow rate measurement for separator w in quarter p (metric tons).
 C_{CO_{2,p,w}} = Quarterly CO₂ concentration measurement in flow for separator w in quarter p (wt. percent CO₂, expressed as a decimal fraction).
 p = Quarter of the year.
 w = Separator.

(2) For each gas-liquid separator for which flow is measured using a volu-

metric flow meter, you must calculate annually the total mass of CO₂ produced from an oil or other fluid stream in metric tons that is separated from the fluid by multiplying the volumetric gas flow at standard conditions by the CO₂ concentration in the gas flow and the density of CO₂ at standard conditions, according to Equation RR-8 of this section. You must collect these data quarterly. Volumetric flow and concentration data measurements must be made in accordance with §98.444.

$$CO_{2,w} = \sum_{p=1}^4 Q_{p,w} * D * C_{CO_{2,p,w}} \quad (\text{Eq. RR-8})$$

Where:

CO_{2,w} = Annual CO₂ mass produced (metric tons) through separator w.
 Q_{p,w} = Volumetric gas flow rate measurement for separator w in quarter p at standard conditions (standard cubic meters).

D = Density of CO₂ at standard conditions (metric tons per standard cubic meter): 0.0018682.
 C_{CO_{2,p,w}} = CO₂ concentration measurement in flow for separator w in quarter p (vol. percent CO₂, expressed as a decimal fraction).

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p = Quarter of the year.
w = Separator.

(3) To aggregate production data, you must sum the mass of all of the CO₂ separated at each gas-liquid separator in accordance with the procedure specified in Equation RR-9 of this section. You must assume that the total CO₂ measured at the separator(s) represents a percentage of the total CO₂ produced. In order to account for the percentage of CO₂ produced that is estimated to remain with the produced oil or other fluid, you must multiply the quarterly mass of CO₂ measured at the separator(s) by a percentage estimated using a methodology in your approved MRV plan. If fluids containing CO₂ from injection wells covered under this source category are produced and not processed through a gas-liquid separator, the concentration of CO₂ in the produced fluids must be measured at a flow meter located prior to reinjection or reuse using methods in §98.444(f)(1). The considerations you intend to use to calculate CO₂ from produced fluids for the mass balance equation must be described in your approved MRV plan in accordance with §98.448(d)(5).

rator(s) by a percentage estimated using a methodology in your approved MRV plan. If fluids containing CO₂ from injection wells covered under this source category are produced and not processed through a gas-liquid separator, the concentration of CO₂ in the produced fluids must be measured at a flow meter located prior to reinjection or reuse using methods in §98.444(f)(1). The considerations you intend to use to calculate CO₂ from produced fluids for the mass balance equation must be described in your approved MRV plan in accordance with §98.448(d)(5).

$$CO_{2P} = (1+X) * \sum_{w=1}^W CO_{2,w} \quad (\text{Eq. RR-9})$$

Where:

CO_{2P} = Total annual CO₂ mass produced (metric tons) through all separators in the reporting year.
CO_{2,w} = Annual CO₂ mass produced (metric tons) through separator w in the reporting year.
X = Entrained CO₂ in produced oil or other fluid divided by the CO₂ separated through all separators in the reporting year (weight percent CO₂, expressed as a decimal fraction).

w = Separator.

(e) You must report the annual mass of CO₂ that is emitted by surface leakage in accordance with your approved MRV plan. You must calculate the total annual mass of CO₂ emitted from all leakage pathways in accordance with the procedure specified in Equation RR-10 of this section.

$$CO_{2E} = \sum_{x=1}^X CO_{2,x} \quad (\text{Eq. RR-10})$$

where:

CO_{2E} = Total annual CO₂ mass emitted by surface leakage (metric tons) in the reporting year.
CO_{2,x} = Annual CO₂ mass emitted (metric tons) at leakage pathway x in the reporting year.
x = Leakage pathway.

year in accordance with the procedures specified in paragraphs (f)(1) and (f)(2) of this section.

(1) If you are actively producing oil or natural gas or if you are producing any other fluids, you must calculate the annual mass of CO₂ that is sequestered in the underground subsurface formation in the reporting year in accordance with the procedure specified in Equation RR-11 of this section.

(f) You must report the annual mass of CO₂ that is sequestered in subsurface geologic formations in the reporting

$$CO_2 = CO_{2I} - CO_{2P} - CO_{2E} - CO_{2FI} - CO_{2FP} \quad (\text{Eq. RR-11})$$

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where:

- CO₂ = Total annual CO₂ mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.
- CO_{2I} = Total annual CO₂ mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.
- CO_{2P} = Total annual CO₂ mass produced (metric tons) in the reporting year.
- CO_{2E} = Total annual CO₂ mass emitted (metric tons) by surface leakage in the reporting year.
- CO_{2FI} = Total annual CO₂ mass emitted (metric tons) from equipment leaks and vented emissions of CO₂ 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_{2FP} = Total annual CO₂ mass emitted (metric tons) from equipment leaks and vented emissions of CO₂ 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 CO₂ 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:

- CO₂ = Total annual CO₂ mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.
- CO_{2I} = Total annual CO₂ mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.
- CO_{2E} = Total annual CO₂ mass emitted (metric tons) by surface leakage in the reporting year.
- CO_{2FI} = Total annual CO₂ mass emitted (metric tons) from equipment leaks and vented emissions of CO₂ 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) *CO₂ received.*

(1) Except as provided in paragraph (a)(4) of this section, you must determine the quarterly flow rate of CO₂ 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 CO₂ 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 CO₂ received from a production process unit that is part of your facility, you may use the quarterly CO₂ 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 CO₂ 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 CO₂ 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 CO₂ in a commercial transaction, you may use the quarterly mass or volume of contents from the sales contract if it is