

Geologic Sequestration of Carbon Dioxide with Enhanced Oil Recovery

Subpart VV, Greenhouse Gas Reporting Program

OVERVIEW

Subpart VV of the Greenhouse Gas Reporting Program (GHGRP) (40 CFR 98.480 – 98.489) applies to any facility that injects carbon dioxide (CO₂) into the subsurface for enhanced recovery operations for oil and other hydrocarbons (CO₂-EOR) and meets the Subpart VV source category definition. Some subparts have thresholds that determine applicability for reporting, and some do not. To decide whether your facility must report under this subpart, please refer to 40 CFR 98.481 and the GHGRP [Applicability Tool](#).

This Information Sheet is intended to help facilities reporting under Subpart VV understand how the source category is defined, what greenhouse gases (GHGs) must be reported, how GHG emissions must be calculated and shared with EPA, and where to find more information



How is This Source Category Defined?

The Subpart VV source category pertains to facilities that:

- Inject carbon dioxide (CO₂) underground for enhanced recovery operations for oil and other hydrocarbon (CO₂-EOR); and
- Use the International Standards Organization (ISO) standard designated as CSA/ANSI ISO 27916:19 (CO₂ capture, transportation and geological storage—CO₂-EOR) as a method of quantifying geologic sequestration (GS) of CO₂ in association with EOR operations.

Facilities that engage in CO₂-EOR projects and use the CSA/ANSI ISO 27916:19 standard as a method of quantifying GS of CO₂ in association with EOR operations must report under Subpart VV; there is no threshold for reporting. The Subpart VV source category does not include facilities that are reporting under Subpart RR or that are permitted as Class VI under the Underground Injection Control (UIC) program. When a facility previously met the source category definition for Subpart UU for CO₂-EOR projects, but then began using CSA/ANSI ISO 27916:19, the facility must report under Subpart UU for the portion of the year before using CSA/ANSI ISO 27916:19 and under Subpart VV for the portion of the year after using CSA/ANSI ISO 27916:19.



What GHGs Must Be Reported?

Under Subpart VV, facilities that engage in CO₂-EOR projects must report the following from Clause 8 of CSA/ANSI ISO 27916:19:

- The mass of CO₂ received by the CO₂-EOR project.
- The mass of CO₂ loss from the CO₂-EOR project operations.
- The mass of native CO₂ produced and captured.
- The mass of CO₂ produced and sent off-site.
- The mass of CO₂ loss from the EOR complex.

- The mass of CO₂ stored in association with CO₂-EOR.

If multiple Greenhouse Gas Reporting Program (GHGRP) source categories are co-located at a facility, the facility may also need to report greenhouse gas (GHG) emissions under one or more different subparts. Please refer to the relevant information sheet for a summary of the rule requirements for any other source categories located at the facility. Facilities that are subject to only Subpart VV are not required to report under Subpart C or any other subpart listed under 40 CFR 98.2(a)(1) or (2).



How Must GHG Emissions Be Calculated?

Under Subpart VV, facilities engaged in CO₂-EOR projects must calculate CO₂ sequestered using the following quantification principles from Clause 8.2 of CSA/ANSI ISO 27916:19:

- Use Equation 1 of VV to calculate the mass of CO₂ stored in association with CO₂-EOR (m_{stored}) in the reporting year by subtracting the mass of CO₂ loss from operations and the mass of CO₂ loss from the EOR complex from the total mass of CO₂ input:

Equation 1 of VV: $m_{\text{stored}} = m_{\text{input}} - m_{\text{loss operations}} - m_{\text{loss EOR complex}}$

$m_{\text{stored}} =$	The annual quantity of associated storage in metric tons of CO ₂ mass.
$m_{\text{input}} =$	The total mass of CO ₂ m_{received} by the EOR project plus m_{native} (see Clause 8.3 of CSA/ANSI ISO 27916:19 and paragraph (c) of this section), metric tons. Native CO ₂ produced and captured in the CO ₂ -EOR project (m_{native}) can be quantified and included in m_{input} .
$m_{\text{loss operations}} =$	The total mass of CO ₂ loss from project operations (see Clauses 8.4.1 through 8.4.5 of CSA/ANSI ISO 27916:19 and paragraph (d) of this section), metric tons.
$m_{\text{loss EOR complex}} =$	The total mass of CO ₂ loss from the EOR complex (see Clause 8.4.6 of CSA/ANSI ISO 27916:19), metric tons.

- The method used to quantify associated storage must assure completeness and preclude double counting. The annual mass of CO₂ that is recycled and reinjected into the EOR complex must not be quantified as associated storage. Loss from the CO₂ recycling facilities must be quantified.
- Quantify the total mass of CO₂ input (m_{input}) in the reporting year by completing the following:
 - Include the total mass of CO₂ received at the custody transfer meter by the CO₂-EOR project (m_{received}). The CO₂ stream received (including CO₂ transferred from another CO₂-EOR project) must be metered.
 - The native CO₂ recovered and included as m_{native} must be documented.
 - CO₂ delivered to multiple CO₂-EOR projects must be allocated among those CO₂-EOR projects.
 - The sum of the quantities of allocated CO₂, which must not exceed the total quantities of CO₂ received.
- Use Equation 2 of VV to calculate the total mass of CO₂ from project operations ($m_{\text{loss operations}}$) in the reporting year:

Equation 2 of VV: $m_{\text{loss operations}} = m_{\text{loss leakage facilities}} + m_{\text{loss vent/flare}} + m_{\text{loss entrained}} + m_{\text{loss transfer}}$

$m_{\text{loss leakage facilities}} =$	Loss of CO ₂ due to leakage from production, handling, and recycling CO ₂ -EOR facilities (infrastructure including wellheads), metric tons.
$m_{\text{loss vent/flare}} =$	Loss of CO ₂ from venting/flaring from production operations, metric tons.
$m_{\text{loss entrained}} =$	Loss of CO ₂ due to entrainment within produced gas/oil/water when this CO ₂ is not separated and reinjected, metric tons.

$m_{\text{loss transfer}}$ = Loss of CO₂ due to any transfer of CO₂ outside the CO₂-EOR project, metric tons. Facilities must quantify any CO₂ that is subsequently produced from the EOR complex and transferred offsite.

- Use the applicable monitoring and quality assurance (QA) requirements set forth in Clause 6.2 of CSA/ANSI ISO 27916:19.
- Whenever the value of a parameter is unavailable or the QA procedures set forth in 40 CFR 98.484 cannot be followed, follow the procedures set forth in Clause 9.2 of CSA/ANSI ISO 27916:19.

A checklist for data that must be monitored is available here: [Subpart VV Monitoring Checklist](#).



What Information Must Be Reported?

In addition to the information required by the General Provisions in Subpart A, found at 40 CFR 98.3(c), the following must be reported:

- The annual quantity of associated storage in metric tons of CO₂ (m_{stored}).
- The density of CO₂ if volumetric units are converted to mass in order to be reported for annual quantity of CO₂ stored.
- The annual quantity of CO₂ input (m_{input}) and:
 - The annual total mass of CO₂ received at the custody transfer meter by the CO₂-EOR project, including CO₂ transferred from another CO₂-EOR project (m_{received}); and
 - The annual mass of native CO₂ produced and captured in the CO₂-EOR project (m_{native}).
- The annual mass of CO₂ that is recycled and reinjected into the EOR complex.
- The annual total mass of CO₂ loss from project operations ($m_{\text{loss operations}}$), and:
 - Loss of CO₂ due to leakage from production, handling, and recycling CO₂-EOR facilities (infrastructure including wellheads) ($m_{\text{loss leakage facilities}}$);
 - Loss of CO₂ from venting/flaring from production operations ($m_{\text{loss vent/flare}}$);
 - Loss of CO₂ due to entrainment within produced gas/oil/water when this CO₂ is not separated and reinjected ($m_{\text{loss entrained}}$); and
 - Loss of CO₂ due to any transfer of CO₂ outside the CO₂-EOR project ($m_{\text{loss transfer}}$).
- The total mass of CO₂ loss from the EOR complex ($m_{\text{loss EOR complex}}$).
- Annual documentation that contains the following components as described in Clause 4.4 of CSA/ANSI ISO 27916:19:
 - The formulas used to quantify the annual mass of associated storage, including the mass of CO₂ delivered to the CO₂-EOR project and losses during the period covered by the documentation (see Clause 8 and Annex B of CSA/ANSI ISO 27916:19).
 - The methods used to estimate missing data and the amounts estimated as described in Clause 9.2 of CSA/ANSI ISO 27916:19).
 - The approach and method for quantification utilized by the operator, including accuracy, precision, and uncertainties (see Clause 8 and Annex B of CSA/ANSI ISO 27916:19).
 - A statement describing the nature of validation or verification including the date of review, process, findings, and responsible person or entity.
 - Source of each CO₂ stream quantified as associated storage (see Clause 8.3 of CSA/ANSI ISO 27916:19).
 - A description of the procedures used to detect and characterize the total CO₂ leakage from

the EOR complex.

- If only the mass of anthropogenic CO₂ is considered for m_{stored} , a description of the derivation and application of anthropogenic CO₂ allocation ratios for all the terms described in Clauses 8.1 to 8.4.6 of CSA/ANSI ISO 27916:19.
- Any documentation provided by a qualified independent engineer or geologist, who certifies that the documentation provided, including the mass balance calculations as well as information regarding monitoring and containment assurance, is accurate and complete.
- Any changes made within the reporting year to containment assurance and monitoring approaches and procedures in the EOR operations management plan.

EOR Operations Management Plan (OMP)

Facilities must submit an EOR OMP and initial documentation to the Administrator with the annual report for the first reporting year that the facility reports under Subpart VV. Any documentation provided by a qualified independent engineer or geologist, who certifies that the documentation provided is accurate and complete, must also be provided to the Administrator.

- **EOR OMP:** Facilities engaged in CO₂-EOR projects must prepare and update, as necessary, a general EOR OMP that:
 - Provides a description of the EOR complex and engineered system (see Clause 4.3(a) of CSA/ANSI ISO 27916:19);
 - Establishes that the EOR complex is adequate to provide safe, long-term containment of CO₂; and
 - Includes site-specific and other information including:
 - Geologic characterization of the EOR complex;
 - A description of the facilities within the CO₂-EOR project;
 - A description of all wells and other engineered features in the CO₂-EOR project;
 - The operations history of the project reservoir; and
 - The information set forth in Clauses 5 and 6 of CSA/ANSI ISO 27916:19.
- **Initial Documentation:** Facilities must also prepare initial documentation at the beginning of the quantification period, and include the following in the EOR OMP:
 - A description of the EOR complex and engineered systems (see Clause 5 of CSA/ANSI ISO 27916:19);
 - The initial containment assurance (see Clause 6.1.2 of CSA/ANSI ISO 27916:19);
 - The monitoring program (see Clause 6.2 of CSA/ANSI ISO 27916:19);
 - The quantification method to be used (see Clause 8 and Annex B of CSA/ANSI ISO 27916:19); and
 - The total mass of previously injected CO₂ (if any) within the EOR complex at the beginning of the CO₂-EOR project (see Clause 8.5 and Annex B of CSA/ANSI ISO 27916:19).

If the EOR OMP is updated, the updated EOR management plan must be submitted to the Administrator with the annual report covering the first reporting year for which the updated EOR OMP is applicable.



What Records Must Be Maintained?

Reporters are required to retain records that pertain to their annual GHGRP report for at least three years after the date the report is submitted. Please see the [Subpart A Information Sheet](#) and 40 CFR 98.3(g) for

general recordkeeping requirements. Specific recordkeeping requirements for Subpart VV are listed at 40 CFR 98.487.



When and How Must Reports Be Submitted?

Reporters must submit their annual GHGRP reports for the previous calendar year to the EPA by March 31st, unless the 31st falls on a Saturday, Sunday, or federal holiday, in which case reports are due on the next business day. Annual reports must be submitted electronically using the [electronic Greenhouse Gas Reporting Tool \(e-GGRT\)](#), the GHGRP's online reporting system.

Additional information on setting up user accounts, registering a facility, and submitting annual reports is available on the [GHGRP Help webpage](#).



When Can a Facility Stop Reporting?

Subpart A, § 98.2(i), which details when facilities can stop reporting, does not apply to Subpart VV. Once a CO₂-EOR project becomes subject to Subpart VV, the facility must continue to comply with all requirements of Subpart VV for each year thereafter until the facility:

- Submits notification to discontinue reporting in accordance with Clause 10 of CSA/ANSI ISO 27916:19;
- Notifies the Administrator of intent to cease reporting and provide a copy of the CO₂-EOR project termination documentation; and
- The CO₂-EOR project terminates or is completed, which occurs when the facility:
 - Ceases injection of CO₂;
 - Ceases production of hydrocarbons (HCs) from the project reservoir; and
 - Plugs and abandons wells unless otherwise required by the appropriate regulatory authority.



For More Information

For additional information on Subpart VV, please visit the [Subpart VV webpage](#). For additional information on the GHGRP, please visit the [GHGRP website](#), which includes additional information sheets, [data](#) previously reported to the GHGRP, [training materials](#), and links to Frequently Asked Questions ([FAQs](#)). For questions that cannot be answered through the GHGRP website, please contact us at: GHGreporting@epa.gov.

This Information Sheet is provided solely for informational purposes. It does not replace the need to read and comply with the regulatory text contained in the rule. Rather, it is intended to help reporting facilities and suppliers understand key provisions of the GHGRP. It does not provide legal advice; have a legally binding effect; or expressly or implicitly create, expand, or limit any legal rights, obligations, responsibilities, expectations, or benefits with regard to any person or entity.