



Our Experience in Developing Monitoring, Reporting,
and Verification (MRV) Plans under the Greenhouse Gas
Reporting Program for UIC Class II Operators

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Who have we worked with...

- ▶ Perdure Petroleum, LLC / Farnsworth Unit, Ochiltree Co., TX
- ▶ Lucid Energy Delaware, LLC / Red Hills Gas Plant, Lea Co., NM
- ▶ Targa Northern Delaware, LLC / Red Hills Gas Plant, Lea Co., NM (currently updating previous MRV plan)
- ▶ Targa Northern Delaware, LLC / Wildcat Gas Plant, Kermit Co., TX (currently developing)
- ▶ Durango Midstream, LLC - Frontier Field Services, LLC / Dagger Draw Gas Plant (Eddy Co., NM) and Maljamar Gas Plant (Lea, Co., NM) (submitted to EPA)
- ▶ Piñon Midstream, LLC / Dark Horse Gas Plant, Lea Co., NM (soon to be submitted)

Quick Overview of GHGRP – 40 CFR 98

Subpart A – General Provisions – includes general monitoring, reporting, recordkeeping and verification requirements, the responsibility of the designated representative, and compliance and enforcement provisions.

Subpart B – Reserved

Subpart C – General Stationary Fuel Combustion Sources

Subpart D – Electricity Generation

Subpart E – Adipic Acid Production

Subpart F – Aluminum Production

Subpart G – Ammonia Manufacturing

Subpart H – Cement Production

Subpart I – Electronics Manufacturing

Subpart J - Reserved

Subpart K – Ferroalloy Production

Subpart L – Fluorinated Gas Production

Subpart M - Reserved

Subpart N – Glass Production

Subpart O – HCFC-22 Production and HFC-23 Destruction

Subpart P – Hydrogen Production

Subpart Q – Iron and Steel Production

Subpart R – Lead Production

Subpart S – Lime Manufacturing

Subpart T – Magnesium Production

Subpart U – Miscellaneous Uses of Carbonate

Subpart V – Nitric Acid Production

Subpart W – Petroleum and Natural Gas Systems – includes instructions for determining leakage from surface equipment

Subpart X – Petrochemical Production

Subpart Y – Petroleum Refineries

Subpart Z – Phosphoric Acid Production

Quick Overview of GHGRP (cont.)

Subpart AA – Pulp and Paper Manufacturing

Subpart BB – Silicon Carbide Production

Subpart CC – Soda Ash Manufacturing

Subpart DD – Electricity Transmission and Distribution Equipment Use

Subpart EE – Titanium Dioxide Production

Subpart FF – Underground Coal Mines

Subpart GG – Zinc Production

Subpart HH – Municipal Solid Waste Landfills

Subpart II – Industrial Wastewater Treatment

Subpart JJ – Manure Management

Subpart KK – Reserved

Subpart LL – Suppliers of Coal-based Liquid Fuels

Subpart MM – Suppliers of Petroleum Products

Subpart NN – Suppliers of Natural Gas and Natural Gas Liquids

Subpart OO – Suppliers of Industrial Greenhouse Gases

Subpart PP – Suppliers of Carbon Dioxide

Subpart QQ – Importers and Exporters of Fluorinated Greenhouse Gases Contained in Pre-Charged Equipment or Closed-Cell Foams

Subpart RR – Geologic Sequestration of Carbon Dioxide – includes instructions for calculating mass of CO₂ sequestered, discussion of monitoring and QA/QC requirements, procedures for estimating missing data, data reporting requirements, instructions for records retention, and instructions for developing monitoring, reporting, and verification (MRV) plans

Subpart SS – Electrical Equipment Manufacture or Refurbishment

Subpart TT – Industrial Waste Landfills

Subpart UU – Injection of Carbon Dioxide – this source category is for a well or group of wells that inject CO₂ into the subsurface but do not report under subpart RR.

GHGRP Requirements for UIC Class II Wells

- ▶ UIC Class II permit holders injecting CO₂ into the subsurface are required to report under Subpart UU of GHGRP, **however...**
- ▶ Class II permit holders may elect to qualify for 45Q tax credits by meeting the Subpart RR reporting requirements including developing and obtaining EPA approval for an MRV plan (Subpart RR of GHGRP [40 CFR 98.440\(c\)\(1\)](#))
 - (c) This source category [geologic sequestration of carbon dioxide] does not include a well or group of wells where a CO₂ stream is being injected into subsurface geologic formations to enhance the recovery of oil or natural gas **unless** one of the following applies:
 - (1) **The owner or operator injects the CO₂ stream for long-term containment in subsurface geologic formations and has chosen to submit a proposed monitoring, reporting, and verification (MRV) plan to EPA and received an approved plan from EPA.**
 - (2) The well is permitted as Class VI under the Underground Injection Control program.

TSD – Technical Support Document

- To assist operators in developing MRV plans that comply with the Greenhouse Gas Reporting Program, EPA has created the '*General Technical Support Document for Injection and Geologic Sequestration of Carbon Dioxide: Subparts RR and UU of the Greenhouse Gas Reporting Program*' or the TSD for short.
- Download the TSD here: <https://www.epa.gov/ghgreporting/subparts-rr-and-uu-technical-support-document>

TSD: Section 5 - MRV Plans (40 CFR 98.448)

- ▶ Delineation of the maximum monitoring area (MMA) and the active monitoring areas (AMA)
: requires development of a geologic model & a simulation model
- ▶ Identification of potential CO₂ surface leakage pathways in the MMA and qualitative evaluation of the likelihood, magnitude, and timing, of CO₂ leakage to the surface through these pathways
: requires geologic characterization, possibly induced seismicity modeling, evaluation of boreholes within MMA particularly those penetrating confining and injection zones
- ▶ Strategy for detection and quantification of CO₂ leakage to the surface
: requires evaluation of existing infrastructure and protocols for leak detection, perhaps using H₂S as a proxy for CO₂; determination of need for additional monitoring capabilities
- ▶ Strategy for establishing the expected baselines for monitoring CO₂ leakage to the surface
: requires evaluation of past monitoring and implementation of concurrent monitoring for CO₂
- ▶ Summary of the considerations used to calculate site-specific variables for the mass balance equation.
: requires detailed evaluation of operations and infrastructure.

TSD: Section 5 - MRV Plans (40 CFR 98.448)

- ▶ UIC permit class and well identification number
- ▶ Proposed date to begin collecting data for calculating total amount of CO₂ sequestered. This date must be after expected baselines are established and the leakage detection and quantification strategy is implemented in the initial AMA.

TSD: Section 6.7 – Required Revision of MRV Plans (98.448(d))

- ▶ Material change to monitoring and/or operational parameters not anticipated in original MRV plan. Examples of material changes include:
 - ▶ Large changes in the volume of CO₂ injected;
 - ▶ Construction of new injection wells not identified in the MRV plan;
 - ▶ Failures of the monitoring system including monitoring system sensitivity, performance, location, or baseline;
 - ▶ Changes to surface land use that affects baseline or operational conditions;
 - ▶ Observed plume location that differs significantly from the predicted plume area used for developing the MRV plan;
 - ▶ Change in the maximum monitoring area or active monitoring area; or
 - ▶ Change in monitoring technology that would result in coverage or detection capability different from the MRV plan.
- ▶ Change in permit class of UIC permit
- ▶ Notification by EPA of substantive errors in MRV plan or monitoring report
- ▶ Reporter chooses to revise plan for any other reason in any reporting year.

MRV Plan Development

- delineate facility according to TSD guidance
- CO₂ from pipelines? containers?
- flow meters – mass or volumetric?
- production at facility? • existing operational plans describing monitoring
- industry standards followed

Operations Data

Injection Well Data

- composition of injectate • CO₂ volume
- injection pressure • injection rate
- duration of injection into future • past injection history • permit applications • permits / orders

MRV Plan

Geologic Data

- formation tops
- thickness of IZ CZ
- porosity of IZ CZ
- permeability IZ CZ
- potential pathways – faults, thru CZ, lateral migration • induced seismicity

Surrounding Wells Data

- production wells? TD, rate • produced water quality • injection wells? TD, rate • past injection history in surrounding area
- geophysical logs • seismic data for area • past production history in surrounding area
- evaluation of boreholes

Our MRV Plan Template

- 1 Introduction
- 2 Facility Information
 - 2.1 Reporter number
 - 2.2 UIC injection well identification numbers
 - 2.3 UIC permit class
- 3 Project Description
 - 3.1 General Geologic Setting / Surficial Geology
 - 3.2 Bedrock Geology
 - 3.2.1 Depositional Basin
 - 3.2.2 Stratigraphy
 - 3.2.3 Faulting
 - 3.3 Lithologic and Reservoir Characteristics
 - 3.3.1 Confining Zone
 - 3.3.2 Injection Zone
 - 3.4 Formation Fluid Chemistry
 - 3.5 Assessment of Potential for Induced Seismicity
 - 3.6 Groundwater Hydrology in the Vicinity of the <facility>
 - 3.7 Historical Operations
 - 3.7.1 <name of the facility>
 - 3.7.2 Operations in the Vicinity of the <name of the facility>
 - 3.8 Description of Injection Process
 - 3.9 Reservoir Characterization Modeling
- 4 Delineation of the Monitoring Areas
 - 4.1 MMA – Maximum Monitoring Area
 - 4.2 AMA – Active Monitoring Area
- 5 Identification and Evaluation of Potential Leakage Pathways to the Surface
 - 5.1 Potential Leakage from Surface Equipment
 - 5.2 Potential Leakage from Approved, Not Yet Drilled Wells (into confining / injection zones)
 - 5.3 Potential Leakage from Existing Wells
 - 5.4 Potential Leakage through Fractures and Faults
 - 5.5 Potential Leakage through the Confining / Seal System
 - 5.6 Potential Leakage due to Natural / Induced Seismicity
 - 5.7 Potential Leakage due to Lateral Migration

Our MRV Plan Template (cont.)

6 Strategy for Detecting and Quantifying Surface Leakage of CO₂

- 6.1 Leakage from Surface Equipment
- 6.2 Leakage from Approved Not Yet Drilled Wells
- 6.3 Leakage from Existing Wells
- 6.4 Leakage from Fractures and Faults
- 6.5 Leakage through the Confining / Seal System
- 6.6 Leakage due to Natural / Induced Seismicity
- 6.7 Leakage due to Lateral Migration

7 Strategy for Establishing Expected Baselines for Monitoring CO₂ Surface Leakage

- 7.1 Visual Inspection
- 7.2 Fixed In-Field, Handheld, and Personal H₂S Monitors
- 7.3 CO₂ Detection
- 7.4 Continuous Parameter Monitoring
- 7.5 Well Surveillance
- 7.6 Seismic Monitoring Stations
- 7.7 Groundwater Monitoring

8 Site Specific Considerations for Determining the Mass of CO₂ Sequestered

- 8.1 CO₂ Received

8.2 CO₂ Injected

8.3 CO₂ Produced / Recycled

8.4 CO₂ Lost through Surface Leakage

8.5 CO₂ Sequestered

9 Estimated Schedule for Implementation of MRV Plan

10 GHG Monitoring and Quality Assurance Program

10.1 GHG Monitoring

10.1.1 General

10.1.2 CO₂ received

10.1.3 CO₂ injected

10.1.4 CO₂ produced

10.1.4 CO₂ emissions from equipment leaks and vented emissions of CO₂

10.1.5 Measurement devices

10.2 QA/QC Procedures

10.3 Estimating Missing Data

10.4 Revisions of the MRV Plan

11 Records Retention

12 Appendices

Electronic Greenhouse Gas Reporting Tool (e-GGRT)

Applicant does...	...then waits while... (days)	EPA does...	Comments
<p>Registers facility on e-GGRT at: https://ghgreporting.epa.gov/ghg/login.do</p> <p>Find e-GGRT help at: https://ccdsupport.com/confluence/display/help/</p> <p>A Certificate of Representation is generated electronically by e-GGRT as part of the facility registration process.</p>			<p>40 CFR 98.4(i)</p>
<p>Submits Certificate of Representation</p> <p style="text-align: center;">.</p> <p style="text-align: center;">.</p> <p style="text-align: center;">.</p> <p style="text-align: center;">.</p> <p style="text-align: center;">.</p> <p style="text-align: center;">.</p> <p>(during this time the DR and ADR(s) must log into e-GGRT and accept appointment.)</p>	<p style="text-align: center;">60</p>	<p>Reviews delegation of Designated Representative (DR) and Alternate Designated Representative (ADR); once EPA approves the DR and ADR(s), sends invitation to them to accept appointment. See flow chart of the process here.</p>	<p>For more information addressing Facility Registration, refer to the following pages:</p> <ul style="list-style-type: none"> • About Facility Registration • Facility Search • Facility Information • Identification of DRs, ADRs, and Agents • Acceptance of DR and ADR Appointment • Acceptance of Agent Delegation • Notice of Delegation • Subpart W Facility Registration

TSD: Section 6 - MRV Plan Approval Process Overview

Applicant does...	...then waits while... (days)	EPA does...	Comments
Submits MRV Plan	15	Receives MRV plan and issues Notice of Receipt	TSD 6.2
	45	Conducts completeness check; determines if the MRV plan is complete within 45 days of the notice of receipt and will notify the reporter whether the plan is complete or incomplete; issues a written notice that either requests additional information or provides notice that the MRV plan is complete and that the technical review will commence.	TSD 6.3 Table 6.1
Submit updated MRV if original was deemed incomplete	45		TSD 6.3
	60	Conducts technical review of MRV; if determines MRV is technically deficient, sends written notice requesting additional information (RFAI)	TSD 6.4
Submit additional information if requested	15		
	“Within a reasonable period of time”	issues a final MRV plan as submitted, or with revisions. EPA will post the approved MRV plan on a public Web site	TSD 6.5
Total Time	6 – 8 months + “a reasonable period of time”		

Questions

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