Preparing for the GHG MRR - Petroleum and Natural Gas Systems

40 CFR Part 98, Subpart W
April 12, 2010 Re-proposal

Outline

- Where we are now – a review of lessons learned and pending technical changes
- Proposed Subpart W - Petroleum and Natural Gas Systems requirements
- Compliance Challenges
- Proposed Subpart RR –Injection and Geologic Sequestration of Carbon Dioxide brief overview
- Questions

Current Status of GHG MRR for Oil and Gas Systems

- Subpart A – General Provisions
  - Took effect January 1, 2010
  - Rule applicability, general monitoring, recordkeeping and reporting requirements for all sources
- Subpart C – Stationary Fuel Combustion Sources
  - Took effect January 1, 2010
  - Applicable to all facilities with combustion emissions of GHGs greater than 25,000 metric tons of CO_2e
  - Specific monitoring, recordkeeping and reporting requirements for certain combustion sources
- Subpart W – Petroleum and Natural Gas Systems
  - Proposed in 2009, re-proposed April 12, 2010
  - Expected to take effect January 1, 2011 with a 25,000 metric tons of CO_2e emissions trigger from all listed source types
  - Specific monitoring, recordkeeping and reporting requirements for oil and gas systems, first report will be due March 31, 2012 for RY 2011

Greenhouse Gas Mandatory Reporting Rule (GHG MRR)

Subparts A and C Lessons Learned

Summary of GHG MRR Implementation

- Lots of details
- Little flexibility
- Some confusion
- Lots of technical amendments

Subpart C Monitoring Matrix

Tier	Tier Applicability for Fossil Fuels	CO_2 Monitoring
1	• May use if fuel is listed, the maximum rated heat input capacity of the unit is <250 mmBtu/hr, and fuel HHV is not analyzed. • May use if fuel is natural gas and consumption is obtained from the fuel supplier in therms.	Fuel consumption from company records
2	• May use if fuel is listed and the maximum rated heat input capacity of the unit is <250 mmBtu/hr. • No size limit if fuel is natural gas or distillate fuel oil.	Fuel consumption from company records and fuel HHV analysis
3	• May use if fuel is listed and Tier 4 is not required. • Shall use if fuel is listed, the maximum rated heat input capacity of the unit is >250 mmBtu/hr, Tier 1 or 2 is not permitted, and Tier 4 is not used. • Shall use if fuel is not listed, non-listed fuel provides 10% or more of heat input, the maximum rated heat input capacity of the unit is >250 mmBtu/hr, and Tier 4 is not used.	Fuel consumption using a calibrated flow meter and fuel carbon analysis
4	• May use for any fuel and unit. • Shall use if fuel is solid and the unit meets certain criteria.	CO_2 emissions using certified CEMS

Note: Does not include biomass fuels and municipal solid waste

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“Natural Gas”

Tier	Tier Applicability for Fossil Fuels	CO_2 Monitoring
1	• May use if fuel is listed, the maximum rated heat input capacity of the unit is <250 mmBtu/hr, and fuel HHV is not analyzed. • May use if fuel is natural gas and consumption is obtained from the fuel supplier in therms.	Fuel consumption from company records
2	• May use if fuel is listed and the maximum rated heat input capacity of the unit is <250 mmBtu/hr.	Fuel consumption from company records

- Natural gas listing in Table C-1 is for **pipeline quality** natural gas only.

- Proposed technical amendments delete “pipeline quality” and revise the definition of “natural gas” (70+% methane and HHV of 910-1,150 Btu/scf).

- Units <250 mmBtu/hr that combust non-pipeline quality natural gas may need to monitor and report.

- Units >250 mmBtu/hr that combust non-pipeline quality gas avoid Tier 3.

Natural Gas Consumption (Tier 1)

Tier	Tier Applicability for Fossil Fuels	CO_2 Monitoring
1	• May use if fuel is listed, the maximum rated heat input capacity of the unit is <250 mmBtu/hr, and fuel HHV is not analyzed. • May use if fuel is natural gas and consumption is obtained from the fuel supplier in therms.	Fuel consumption from company records
2	• May use if fuel is listed and the maximum rated heat input capacity of the unit is <250 mmBtu/hr. • No size limit if fuel is natural gas or distillate fuel oil.	Fuel consumption from company records and fuel HHV analysis

• Proposed new Tier 1 criteria avoids Tier 2 if natural gas consumption is obtained in therms.

• No unit size limitation.

4	• May use for any fuel and unit. • Shall use if fuel is solid and the unit meets certain criteria.	CO_2 emissions using certified CEMS

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“Company Records” (Tier 1 and 2)

Tier	Tier Applicability for Fossil Fuels	CO_2 Monitoring
1	• May use if fuel is listed, maximum rated heat input capacity of unit is <250 mmBtu/hr, and fuel HHV is not analyzed. • May use if fuel is natural gas and consumption is obtained from the fuel supplier in therms.	Fuel consumption from company records
2	• May use if fuel is listed and maximum rated heat input capacity of unit is <250 mmBtu/hr. • No size limit if fuel is natural gas or distillate fuel oil.	Fuel consumption from company records and fuel HHV analysis

• Calibration requirements for flow meters in § 98.3(i) don’t apply.

• Does each fuel flow or billing meter convert measured values to SCF at rule STP (68°F and 14.7 psia)?

• Does the GHG Monitoring Plan include, for non-billing meters, (1) an explanation of how records are used to calculate emissions, (2) the accuracy of flow measuring devices, (3) procedures to ensure the accuracy of flow measuring devices, and (4) the technical basis?

Fuel HHV Analysis (Tier 2)

Tier	Tier Applicability for Fossil Fuels	CO_2 Monitoring
1	• May use if fuel is listed, the maximum rated heat input capacity of the unit is <250 mmBtu/hr, and fuel HHV is not analyzed. • May use if fuel is natural gas and consumption is obtained from the fuel supplier in therms.	Fuel consumption from company records
2	• May use if fuel is listed and the maximum rated heat input capacity of the unit is <250 mmBtu/hr. • No size limit if fuel is natural gas or distillate fuel oil.	Fuel consumption from company records and fuel HHV analysis

- Proposed technical amendment allows arithmetic averaging of HHV data, rather than flow-weighted averaging, if unit rating is <100 mmBtu/hr.

- Proposed technical amendments for blended fuels.

- Is fuel HHV data (Btu/scf) reported at rule STP conditions?

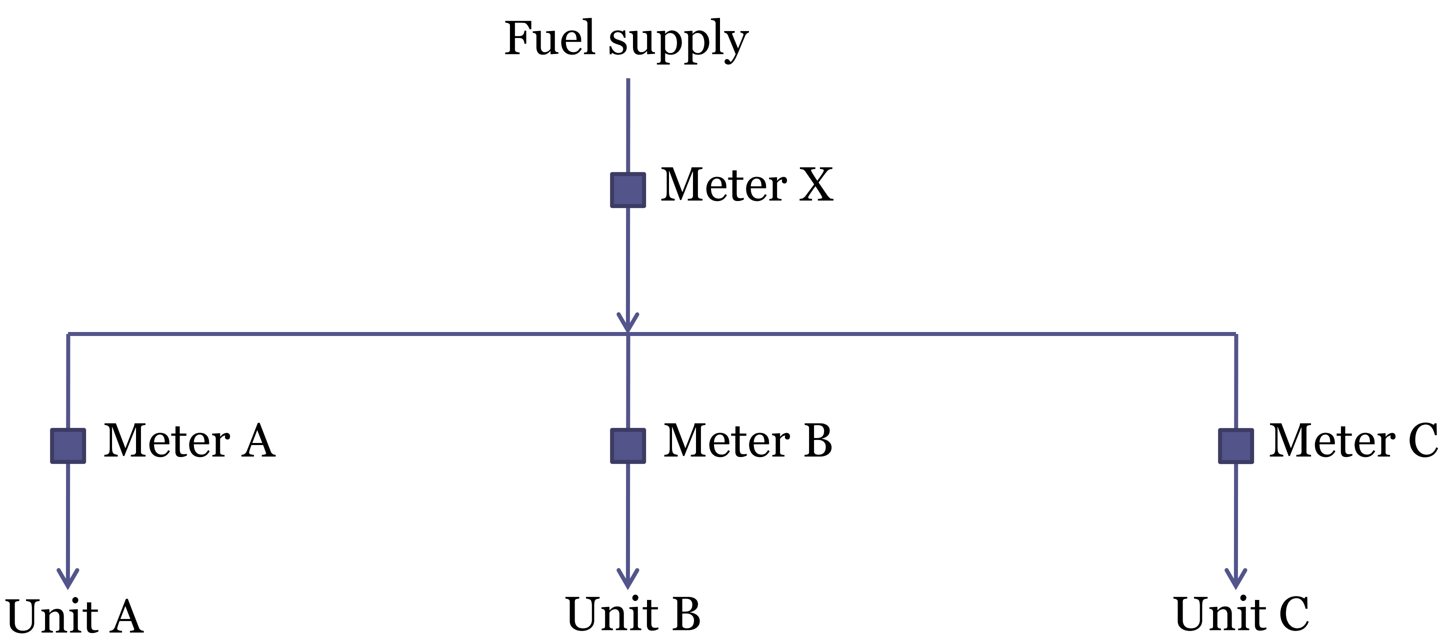
Flow Meter Calibration (Tier 3)

- Proposed technical amendment allows mass flow meters for gaseous fuel, if gas density is measured (same frequency as fuel carbon analysis).
- Calibrate flow, temperature and pressure elements, as applicable.

Tier	Tier Applicability for Fossil Fuels	CO_2 Monitoring
3	• May use if fuel is listed and Tier 4 is not required. • Shall use if fuel is listed, the maximum rated heat input capacity of the unit is >250 mmBtu/hr, Tier 1 or 2 is not permitted, and Tier 4 is not used. • Shall use if fuel is not listed, unlisted fuel provides 10% or more of heat input, the maximum rated heat input capacity of the unit is >250 mmBtu/hr, and Tier 4 is not used.	Fuel consumption using a calibrated flow meter and fuel carbon analysis
4	• May use for any fuel and unit. • Shall use if fuel is solid and the unit meets certain criteria.	CO_2 emissions using certified CEMS

Common Fuel Pipe

What if $| X - (A + B + C) |$ is greater than the calibration error of the meters?



Monitoring Data Conversion Errors

- Some common errors
  - Volumetric flow meters, such as billing meters, that calculate SCF using non-MRR standard conditions (often 60 degF versus 68 degF at 14.7 psia in the MRR)
  - Software, such as E&P Tanks and GRI-GLYCalc, that calculates SCF using non-MRR standard conditions
  - Mass flow meters that calculate SCF using non-MRR standard conditions or incorrect gas molecular weight
  - Fuel gas HHV measurements using non-MRR standard conditions
  - Incorrect GHG densities in Subpart W

Missing Data

- No available "quality-assured value"
- Examples of available values that are not "quality-assured"
  - Invalid CEMS data
  - Analysis not in accordance with reference method
  - Fuel flow from an uncalibrated flow meter, if calibration is required (e.g. Tier 3)
  - Fuel flow by a flow meter that isn't "accurate"?

Confidential Business Information

- Proposed confidentiality rule
- Information that can be claimed confidential
  - Production, throughput and raw material data
  - Process-specific data
- Information that cannot be claimed confidential
  - Emissions, calculation methods and data inputs
  - Missing data information

Greenhouse Gas Reporting Tool (e-GGRT)

- Register the facility in e-GGRT
  - Allow at least 10 days for registration
- Select "Designated Representative" for facility
  - Must be same person who signs other reports
  - Alternate may also be selected
- Submit Certificate(s) of Representation
  - Must be submitted by January 31, 2011
  - Facility must be registered first
- Complete and certify report by March 31, 2011
  - Certification may be delegated

Questions?

Proposed Subpart W – Petroleum and Natural Gas Systems

What does Subpart W include?

- Report carbon dioxide **(CO_2)** and methane **(CH_4)** emissions for the following sources:
  - Offshore petroleum and natural gas production
  - Onshore petroleum and natural gas production (*Facility defined as basin-wide activities*)
  - Onshore natural gas processing plants
  - Onshore natural gas transmission compression
  - Underground natural gas storage
  - Liquefied natural gas (LNG) storage
  - LNG import and export equipment
  - Natural Gas Distribution

When am I Required to Report?

- Reporting threshold is 25,000 MT/yr of CO_2e, actual emissions, which is equivalent to:
  - 54 mmBtu/hr combustion of natural gas
  - 118 scfm continuous release of methane
  - 62 mmscf annual release of methane
- If it's uncertain that actual emissions will be under the reporting threshold, what are my options?
  - May have to monitor emissions according to the rule, reporting only if annual emissions exceed the threshold.
  - Combustion sources were easy to forecast, the uncertain CH_4 emissions of the new source types suggests monitoring consistent with Subpart W at a much lower forecast threshold (15,000 tonnes? 10,000 tonnes? CO_2e) just in case.

What else must be reported?

- All **Combustion Sources (not including flares)** should be reported under **Subpart C.**
  - **Include CO_2, CH_4, and nitrous oxide (N_2O) emissions**

- **Flares** as required for Subpart W should include **CO_2, CH_4, and N_2O** emissions

- Check for **Subpart PP** (Suppliers of CO_2) applicability

GHG MRR Source Types
Offshore Petroleum and Natural Gas Production Facilities

Report CH_4 and CO_2 emissions from all "stationary fugitive" and "stationary vented" sources as identified in the Minerals Management Service (MMS) Gulfwide Offshore Activity Data System (GOADS) study (2005 Gulfwide Emission Inventory Study MMS 2007–067).

GHG MRR Source Types
Onshore Petroleum and Natural Gas Production

NG pneumatic high bleed device vents	Well testing
NG pneumatic gas pumps	Associated gas venting
Acid gas removal vents	Centrifugal compressor wet seal vents
Dehydrator vents	Reciprocating compressors
Well venting for liquids unloading	Blowdown vents
Unconventional well completions & workovers	Dissolved CO2 retained in hydrocarbon liquids
Conventional well completions & workovers	Coal bed methane produced water emissions
Monitored fugitive emission sources	Unmonitored fugitive emission sources
Production & processing tanks	Dissolved CO2 retained in produced water
Transmission tanks	Portable equipment
Flares	EOR injection pump blowdowns

GHG MRR Source Types
Onshore Natural Gas Processing Plants

(1) Reciprocating compressor rod packing venting.
(2) Centrifugal compressor wet seal degassing venting.
(3) Storage tanks.
(4) Blowdown vent stacks.
(5) Dehydrator vent stacks.
(6) Acid gas removal vent stack.
(7) Flare stacks.
(8) Gathering pipeline fugitives.
(9) Fugitive emissions (CH_4 and CO_2).

GHG MRR Source Types
Onshore Natural Gas Transmission Compression

(1) Reciprocating compressor rod packing venting.

(2) Centrifugal compressor wet seal degassing venting.

(3) Transmission storage tanks.

(4) Blowdown vent stacks.

(5) Natural gas pneumatic high bleed device venting.

(6) Natural gas pneumatic low bleed device venting.

(7) Fugitive emissions (CH_4 and CO_2).

GHG MRR Source Types Underground Natural Gas Storage

(1) Reciprocating compressor rod packing venting.

(2) Centrifugal compressor wet seal degassing venting.

(3) Natural gas pneumatic high bleed device venting.

(4) Natural gas pneumatic low bleed device venting.

(5) Fugitive emissions (CH_4 and CO_2).

GHG MRR Source Types LNG Storage and LNG Import and Export

(1) Reciprocating compressor rod packing venting.

(2) Centrifugal compressor wet seal degassing venting.

(3) Fugitive emissions (CH_4 and CO_2).

LNG Import and Export category reports on the above plus

(4) Blowdown vent stacks.

GHG MRR Source Types Natural Gas Distribution

(1) Above ground meter regulators and gate station fugitive emissions from connectors, block valves, control valves, pressure relief valves, orifice meters, other meters, regulators, and open ended lines.

(2) Below ground meter regulators and vault fugitives.

(3) Pipeline main fugitives.

(4) Service line fugitives.

GHG MRR Source Emission Calculation Basis

Source Category	Monitoring Activity
Combustion sources	Subpart C Methodology: fuel flow metering and/or engineering calculations.
Pneumatic high bleed devices (>6 scfh)	Manufacturers data, log of minutes of operation, engineering calculations.
Natural gas driven pneumatic pump venting	Manufacturers data, log of volume of liquid pumped, engineering calculations.
Well venting for liquid unloading	Gas flow metering and/or engineering calculations to establish emission factor repeated every year for each well specification in each field. Maintain records of venting hours at each well.
Unconventional well completion and workovers	Gas flow metering and/or engineering calculations to establish emission factors repeated every two years for each well specification in each field. Maintain records of venting hours at each well.
Conventional well completion and workovers	Engineering calculations based on daily gas production rate and records of venting minutes at each well.
Process unit venting	Gas flow metering for Acid Gas Removal units and/or engineering calculations (GlyCalc) for dehydrators.

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GHG MRR Source Emission Calculation Basis (pg 2)

Source Category	Monitoring Activity
Blowdown vents	Engineering calculations based on vented volume and records of blowdown activity, to include maintenance venting.
Onshore production and processing storage tank vents	E&P Tanks model or engineering calculations if outside E&P Tanks parameters.
Transmission storage tank vents	Uncontrolled tanks require optical gas imaging and vent flow metering if emissions are continuous, controlled tanks use E&P Tanks model or engineering calculations.
Well testing venting and flaring	Use gas to oil ratio (GOR) and records of activity to calculate.
Associated venting and flaring	Use gas to oil ratio (GOR) and records of activity to calculate natural gas vented or flared.
Flares	Gas flow metering, gas composition analysis, and/or process information and engineering calcs.
Centrifugal compressors	Vent flow metering (continuous or temporary to establish rate) and records of hours of operation.
Reciprocating compressors	Vent flow metering or bagging, or high flow sampling for each operating condition.

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GHG MRR Source Emission Calculation Basis (pg 3)

Source Category	Monitoring Activity
Monitored fugitive sources (98.233(q))	Optical gas imaging for specified sources at onshore gas processing, gas transmission compression, underground natural gas storage, LNG storage, LNG import and export, and natural gas distribution facilities. Only applies to components in greater than 10 wt.% CH_4+CO_2 service (GHG not VOC service).
Non-monitored fugitive sources (98.233(r))	Component counts for specified sources at onshore petroleum and natural gas production, onshore gas processing, gas transmission compression, underground natural gas storage, LNG storage, LNG import and export, and natural gas distribution facilities. Only applies to components in greater than 10 wt.% CH_4+CO_2 service.
Pneumatic low bleed devices	Component count and emission factors only
EOR injection pump blowdown	Engineering calculations based on vented volume and records of blowdown activity.
Dissolved CO2 in produced hydrocarbon and water	Quarterly sampling downstream of storage tank (hydrocarbon) or separator (water) and annual production.
Portable equipment	Fuel flow metering or engineering calculations using Subpart C methodology.

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Potential Challenges

- Defining an Onshore Production Facility
  - The current definition includes all operations in a production basin, from well pads to sales lines.
  - This all-encompassing approach brings thousands of minor sites into a single “facility” with all associated requirements.
  - Definition overlap.
- Simple equipment inventories do not currently exist
  - Tracking fugitive components from well head to processing is rare.
  - Detailed inventories of pneumatic equipment may not be available or up-to-date for field operations.
  - Portable equipment emissions for well head emissions are not typically calculated (as they do not meet the federal definition of a stationary source).

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Potential Challenges (page 2)

- Additional monitoring and sampling requirements
  - Calculating CO_2 emissions from produced hydrocarbon liquids and produced water require quarterly sampling
  - Well unloading/unconventional completions and workovers require representative gas flow metering
  - Portable flow metering, vent bagging, or high flow sampling may be required for transmission tank vents, centrifugal compressor wet seals, and reciprocating compressor rod packing
- New leak detection (LD) program
  - Proposed rule lists optical gas imaging as the only approved leak detection method for fugitive sources and transmission tank vents
  - New focus on non-VOC components, GHG service defined as greater than 10 wt% CH_4+CO_2.
- Blowdown vents
  - All maintenance and blowdown emission points are covered; no *de minimis* exemption

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Potential Challenges (page 3)

- Portable units
  - Portable compressors, electrical generators, boilers, heaters – not clear if this is limited to well site equipment.
- Monitoring Device QA Issues
  - Documentation of portable flow monitoring device QA, maintenance and repair procedures in the GHG Monitoring Plan.
  - Applicability of the 5% calibration error specification in Subpart A to portable monitoring devices.
  - Calibration of flow meters, composition analyzers and pressure gauges to a consensus standard **prior to first reporting year** and **annually thereafter**. If consensus standard not available must use manufacturer's method.
  - Monitoring data conversion errors.

Preparation Activities in 2010

- Locate your data
  - Develop covered source inventories
- Identify facilities that need to be monitored
  - Perform initial calibrations
  - Perform or schedule OGI monitoring where appropriate
  - Screen facilities using a GHG emissions calculator
- Develop/revise GHG Monitoring Plans
  - Document sources, calculations, data collection methods and responsibilities
  - Assess and document monitoring devices and associated QA procedures
- Develop GHG data management systems

Questions?

Proposed Subpart RR – Injection and Geologic Sequestration of Carbon Dioxide
A Brief Overview

What does Subpart RR include?

1. Broad Source Definition

The injection and geologic sequestration of carbon dioxide (CO_2) source category comprises any well or group of wells that inject CO_2 into the subsurface, which includes under a seabed offshore. The source category consists of all wells that inject CO_2 into the subsurface, including wells for geologic sequestration (GS) or for any other purpose.

2. Broad Exclusion for EOR Facilities

A facility that injects CO_2 to enhance the recovery of oil or natural gas is not a geologic sequestration facility unless the facility submits a monitoring, reporting and verification (MRV) plan to EPA for approval.

Subpart RR – Big Picture

- For the Oil and Gas Industry using CO_2 for EOR, Subpart RR is an Opt-In program.
- To become a Geologic Sequestration facility you must create, submit and receive EPA approval for a monitoring, reporting and verification (MRV) plan of potential CO_2 leakage.
- MRV plan requirements not finalized but would include detailed assessment of leakage risk, strategy for detecting and quantifying CO_2 surface leakage, a pre-injection environmental baseline determination, and a site specific CO_2 mass balance.

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Questions?

David L Mahler, P.E.
dmahler@zephyrenv.com
410-312-7909

Thomas I. Sullivan, P.E.
tsullivan@zephyrenv.com
512-879-6632

Zephyr Environmental Corp.
www.zephyrenv.com
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