Note: This monitoring checklist does not include changes from the 12/23/11 final rule 76 FR 80554 (Technical Revisions and Clarifications to subpart A and subpart W), or corrections from the pending proposed rule, "2012 Technical Corrections, Clarifying and Other Amendments to the Greenhouse Gas Reporting Rule, and Proposed Confidentiality Determinations for Certain Data Elements of the Fluorinated Gas Source Category." EPA is working to update these checklists. Additional information on the subpart W rules can be found at http://www.epa.gov/climatechange/emissions/subpart/w.html. Reporters should refer to the e-CFR for the final rule (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9415fad5f1c7ea4d940d308e1ea74e11&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl).

Petroleum and Natural Gas Systems Monitoring Checklist for Onshore Petroleum and Natural Gas Production

United States Environmental Protection Agency

Final Rule: Mandatory Reporting of Greenhouse Gases (40 CFR Part 98)

What must be monitored?

If emissions are going to flares, need data elements under the source flare stacks.

Record these parameters on an annual basis, unless specified otherwise.

1. Natural Gas Pneumatic Device Venting

- ☐ Actual and estimated counts of high bleed devices
- ☐ Actual and estimated counts of low bleed devices
- ☐ Actual and estimated counts of intermittent bleed devices
- ☐ Concentration of CO_2
- ☐ Concentration of CH_4

2. Natural Gas Driven Pneumatic Pump Venting

- ☐ Count of natural gas driven pneumatic pumps
- ☐ Concentration of CH_4 in produced natural gas
- ☐ Concentration of CO_2 in produced natural gas

3. Well Venting for Liquids Unloading

If Using Calculation Methodology 1:

For Methodology 1, record these parameters once in two years.

- ☐ Count of wells vented to the atmosphere for liquids unloading
- ☐ Cumulative amount of time of venting from all wells of same tubing diameter and producing horizon/formation combination during the year (hours)
- ☐ Average casing diameter (inches)
- ☐ Actual pressure (psia)
- ☐ Count of plunger lifts.
- ☐ Average flow rate of measured well venting for the recorded time of one representative well venting to the atmosphere under actual conditions for each unique tubing diameter and producing horizon/formation combination during the year (cubic feet per hour of venting)
- ☐ Actual temperature (°F)
- ☐ Cumulative number of unloadings vented to the atmosphere

If Using Calculation Methodology 2:

- ☐ Count of wells vented to the atmosphere for liquids unloading
- ☐ Number of vents per year
- ☐ Well depth to first producing horizon (feet)
- ☐ Time that the well was left open to the atmosphere during unloading (hours)
- ☐ Actual pressure (psia)
- ☐ Cumulative number of unloadings vented to the atmosphere
- ☐ Count of plunger lifts.
- ☐ Casing diameter (inches)
- ☐ Shut-in pressure (psia)
- ☐ Average sales flow rate of gas well (cubic feet per hour)
- ☐ Actual temperature (°F)

If Using Calculation Methodology 3:

- ☐ Count of wells vented to the atmosphere for liquids unloading
- ☐ Number of vents per year
- ☐ Tubing depth to plunger bumper (feet)
- ☐ Time that well was left open to the atmosphere during unloading (hours)
- ☐ Count of plunger lifts
- ☐ Tubing diameter (inches)
- ☐ Sales-line pressure (psia)
- ☐ Average sales flow rate of the measured well venting (cubic feet per hour)

- ☐ Actual pressure (psia)
- ☐ Cumulative number of unloadings vented to the atmosphere
- ☐ Actual temperature (°F)

4. Gas Well Venting During Completions without Hydraulic Fracturing

- ☐ Average daily gas production rate of all wells completed during the reporting year (cubic feet/hour)
- ☐ Cumulative amount of time of all well completions venting (hours)
- ☐ Actual pressure (psia)
- ☐ Total number of days of gas venting to the atmosphere during backflow for completion
- ☐ Total count of completions in calendar year
- ☐ Actual temperature (°F)
- ☐ Vent and flared emissions separately (cubic feet)

5. Gas Well Venting During Workovers without Hydraulic Fracturing

- ☐ Actual pressure (psia)
- ☐ Total count of workovers in calendar year
- ☐ Total number of days of gas venting to the atmosphere during backflow for workover
- ☐ Actual temperature (°F)
- ☐ Vent and flared emissions separately (cubic feet)

6. Gas Well Venting During Well Completions with Hydraulic Fracturing

For Methodologies 1 & 2, record these parameters once in two years.

- ☐ Cumulative amount of time of all well completion venting in a field during the year (hours)
- ☐ Number of completions employing reduced emissions completions and engineering estimate based on best available data of the amount of gas recovered to sales
- ☐ Average flow rate of the measured well completion venting under actual conditions converted to standard conditions (cubic feet per hour)
- ☐ Total count of completions in Calendar Year

- ☐ Actual pressure (psia)
- ☐ Vent and flared emissions separately at standard conditions (cubic feet)
- ☐ Actual temperature (°F)
- ☐ Volume of CO_2 or N_2 injected gas at standard conditions that was injected into the reservoir during an energized fracture job (cubic feet)
- ☐ Volume of natural gas at standard conditions that was recovered into a sales pipeline (cubic feet)
- ☐ Total number of days of gas venting to the atmosphere during backflow for completion

If Using Calculation Methodology 1:

- ☐ Average flow rate of venting to atmosphere or routing to flare by recording flow meter (cubic feet per hour)

If Using Calculation Methodology 2:

- ☐ Average flow rate under subsonic/sonic flow conditions (cubic feet per hour)
- ☐ Actual pressure (psia)
- ☐ Cross sectional area of orifice (m^2)
- ☐ Upstream temperature (K)
- ☐ Upstream pressure (psia)
- ☐ Downstream pressure (psia)

7. Gas Well Venting During Well Workovers with Hydraulic Fracturing

For Methodologies 1 & 2, record these parameters once in two years.

- ☐ Cumulative amount of time of all well workover venting in a field during the year (hours)
- ☐ Average flow rate of the measured well workover venting under actual conditions converted to standard conditions (cubic feet per hour)
- ☐ Number of workovers employing reduced emissions completions and engineering estimate based on best available data of the amount of gas recovered to sales
- ☐ Total count of workovers in calendar year
- ☐ Actual pressure (psia)
- ☐ Vent and flared emissions separately at standard conditions (cubic feet)
- ☐ Actual temperature (°F)
- ☐ Volume of CO_2 or N_2 injected gas at standard conditions that was injected into the reservoir during an energized fracture

job (cubic feet)

- ☐ Volume of natural gas at standard conditions that was recovered into a sales pipeline (cubic feet)
- ☐ Total number of days of gas venting to the atmosphere during backflow for workovers

If Using Calculation Methodology 1:

- ☐ Average flow rate of venting to atmosphere or routing to flare by recording flow meter (cubic feet per hour)

If Using Calculation Methodology 2:

- ☐ Average flow rate under subsonic/sonic flow conditions (cubic feet per hour)
- ☐ Actual pressure (psia)
- ☐ Cross sectional area of orifice (m2)
- ☐ Upstream temperature (K)
- ☐ Upstream pressure (psia)
- ☐ Downstream pressure (psia)

8. Flare Stack Emissions

- ☐ Continuous flow monitor on flare (Y/N)
- ☐ Continuous gas analyzer on the gas to the flare (Y/N)
- ☐ Volume of gas sent to flare annually (cubic feet)
- ☐ Percent of gas sent to un-lit flare
- ☐ Flare combustion efficiency (98% if manufacturer data not available)
- ☐ Mole fraction of CO_2 in gas to the flare
- ☐ Mole fraction of gas hydrocarbon constituents (such as methane, ethane, propane, butane, and pentanes-plus)
- ☐ Actual Process Temperature (°F)
- ☐ Actual Process Pressure (psia)

9. Storage Tanks Emissions

- ☐ Storage tank receiving separator oil have a vapor recovery system (Y/N)
- ☐ Count of wellhead separators that dump valve factor is applied to, if well head gas-liquid separator liquid dump valve is not functioning properly during the calendar year

- ☐ Total time well head gas-liquid separator liquid dump valve is not closing properly in the calendar year (hours)
- ☐ Percent of gas sent to un-lit flare

If Using Calculation Methodology 1:

- ☐ Range of concentrations of flash gas, for CH_4 and CO_2
- ☐ Sales oil or stabilized oil production rate (barrels per day)
- ☐ Average separator temperature (°F)
- ☐ Ambient air temperature (°F)
- ☐ Average separator pressure (psig)
- ☐ Ambient air pressure (psig)
- ☐ Average sales oil or stabilized oil API gravity (°)
- ☐ Separator oil composition and Reid vapor pressure
- ☐ Number of wellhead separators sending oil to atmospheric tanks
- ☐ Count of hydrocarbon tanks at well pads
- ☐ Best estimate of count of stock tanks not at well pads receiving oil
- ☐ Total volume of oil from all wellhead separators sent to tank(s) annually (barrels)
- ☐ Count of tanks with emissions control measures, either vapor recovery system or flaring, for tanks at well pads
- ☐ Best estimate of count of stock tanks assumed to have emissions control measures not at well pads, receiving oil

If Using Calculation Methodology 2:

- ☐ Number of wellhead separators sending oil to atmospheric tanks
- ☐ Separator temperature (°F)
- ☐ Separator pressure (psig)
- ☐ Sales oil or stabilized oil API gravity (°)
- ☐ Count of hydrocarbon tanks at well pads
- ☐ Total volume of oil from all wellhead separators sent to tank(s) annually (barrels)
- ☐ Best estimate of count of stock tanks not at well pads receiving oil
- ☐ Count of tanks with emissions control measures, either vapor recovery system or flaring, for tanks at well pads
- ☐ Best estimate of count of stock tanks assumed to have emissions control measures not at well pads, receiving
- ☐ Range of concentrations of flash gas, for CH_4 and CO_2

oil

- ☐ Separator oil composition at separator pressure and temperature (for the assumption that all of the CH_4 and CO_2 in solution in the separator oil is emitted)

If Using Calculation Methodology 3:

- ☐ Total volume of sales oil from all wells annually (barrels)
- ☐ Total number of wells sending oil to separators off the well pads
- ☐ Count of hydrocarbon tanks on wellpads
- ☐ Produced oil and gas compositions (for the assumption that all of the CH4 and CO2 in both oil and gas are emitted from the tank)
- ☐ Total number of wells sending oil directly to tanks
- ☐ Sales oil API gravity range for wells sending oil directly to tanks and for wells sending oils to separators off the well pads (°)
- ☐ Count of hydrocarbon tanks, both on and off well pads assumed to have emissions control measures: either vapor recovery system or flaring of tank vapors

If Using Calculation Methodology 4:

- ☐ Total volume of sales oil from all wells annually (barrels)
- ☐ Total number of wells sending oil to separators off the well pads
- ☐ Count of hydrocarbon tanks on wellpads
- ☐ Well production oil and gas compositions (for the assumption that all of the CH4 and CO2 in the oil are emitted from the tank)
- ☐ Total number of wells sending oil directly to tanks
- ☐ Sales oil API gravity range for wells sending oil directly to tanks and for wells sending oils to separators off the well pads (°)
- ☐ Count of hydrocarbon tanks, both on and off well pads assumed to have emissions control measures: either vapor recovery system or flaring of tank vapors

If Using Calculation Methodology 5:

- ☐ Number of wellhead separators
- ☐ Number of wells without wellhead

separators

- ☐ Total volume of oil production annually (barrels)
- ☐ Best estimate of fraction of production sent to tanks with assumed control measures: either vapor recovery system or flaring of tank vapors
- ☐ Count of hydrocarbon tanks on well pads

10. Reciprocating Compressor Rod Packing Venting

- ☐ Count of compressors
- ☐ Actual Process Temperature (°F)
- ☐ Actual Process Pressure (psia)

11. Well Testing Venting and Flaring

- ☐ Average gas –to-oil ratio (GOR) of the hydrocarbon production from each well tested (cubic feet of gas per barrel of oil)
- ☐ Flow rate for the well being tested (barrels of oil per day)
- ☐ Duration of the well test (number of days during the year)
- ☐ Number of wells tested per basin in calendar year
- ☐ Actual Process Pressure (psia)
- ☐ Actual Process Temperature (°F)
- ☐ Venting gas emissions

12. Associated Gas Venting and Flaring

- ☐ GOR of the hydrocarbon production from each well whose associated natural gas is vented or flared (cubic feet of gas per barrel of oil)
- ☐ Volume of oil produced in the calendar year during which associated gas was vented or flared (barrels)
- ☐ Number of wells venting or flaring associated natural gas in calendar year
- ☐ Actual Process Temperature (°F)
- ☐ Actual Process Pressure (psia)
- ☐ Flaring gas emissions

13. Dehydrator Vents

For glycol dehydrator with a throughput greater than or equal to 0.4 million cubic feet per day:

- ☐ Feed natural gas flow rate (million standard cubic feet per day)
- ☐ Feed natural gas water content
- ☐ Outlet natural gas water content
- ☐ Absorbent circulation pump type (natural gas pneumatic/air pneumatic/ electric)
- ☐ Absorbent circulation rate
- ☐ Absorbent type (TEG/DEG/EG)
- ☐ Use of stripping natural gas (Y/N)
- ☐ Use of flash tank separator (Y/N)
- ☐ Total time of operation (hours)
- ☐ Wet natural gas temperature (°F)
- ☐ Wet natural gas composition
- ☐ Wet natural gas pressure (psig)
- ☐ Concentration of CH_4 in natural gas
- ☐ Concentration of CO_2 in natural gas
- ☐ Vent gas controls used
- ☐ Vent and flared emissions separately (cubic feet)

For glycol dehydrator with a throughput less than to 0.4 million standard cubic feet per year:

- ☐ Count of glycol dehydrators
- ☐ Vent gas controls used
- ☐ Vent emissions (cubic feet)

For absorbent desiccant dehydrators:

- ☐ Count of desiccant dehydrators
- ☐ Vent gas controls used
- ☐ Time between refilling (days)
- ☐ Pressure of the gas (psia)
- ☐ Height of the dehydrator vessel (ft)
- ☐ Inside diameter of the vessel (ft)
- ☐ Percent of packed vessel volume that is gas

14. EOR Injection Pump Blowdown

- ☐ Total volume of blowdown equipment chambers between isolation valves (cubic feet)
- ☐ Number of blowdowns per calendar year
- ☐ Density of critical phase EOR injection gas (kg/ft^3)
- ☐ Mass fraction of GHG in critical phase injection gas
- ☐ Pump capacity (barrels per day)

15. Acid Gas Removal (AGR) Vents

If using Calculation Methodology 1:

- ☐ Total throughput into the AGR unit and/or total throughput out of the AGR unit (cubic feet per year)
- ☐ Volume fraction of CO_2 content in the vent from the AGR unit
- ☐ Emissions recovered and transferred outside the facility

If using Calculation Methodology 2:

- ☐ Total throughput out of the AGR unit at actual conditions (cubic feet)
- ☐ Volume fraction of CO_2 content in vent gas from the AGR unit
- ☐ Emissions recovered and transferred outside the facility

If using Calculation Methodology 3:

- ☐ Total throughput through the AGR unit at actual conditions (cubic feet)
- ☐ Volume fraction of CO_2 content in natural gas into the AGR unit
- ☐ Volume fraction of CO_2 content in natural gas out of the AGR unit
- ☐ Actual pressure (psia)
- ☐ Actual Temperature (°F)
- ☐ Emissions recovered and transferred outside the facility

If using Calculation Methodology 4:

- ☐ Natural gas feed temperature
- ☐ Natural gas feed pressure

- ☐ Natural gas flow rate
- ☐ Unit operating hours, excluding downtime for maintenance or standby
- ☐ Solvent pressure
- ☐ Solvent circulation rate
- ☐ Solvent weight
- ☐ Acid gas content of feed natural gas
- ☐ Acid gas content of outlet natural gas
- ☐ Exit temperature of natural gas
- ☐ Solvent temperature

16. EOR Hydrocarbon Liquids Dissolved CO_2

- ☐ Volume of crude oil produced annually (barrels)
- ☐ Amount of CO_2 retained in hydrocarbon liquids at STP conditions (metric tons per barrel)

17. Centrifugal Compressor Wet Seal Degassing Venting

- ☐ Total number of centrifugal compressors

18. Valves

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CO_2 emissions from all valves (standard cubic feet)
- ☐ Report CH_4 emissions from all valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

19. Connectors

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CO_2 emissions from all connectors (standard cubic feet)
- ☐ Report CH_4 emissions from all connectors (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

20. Open Ended Lines

- ☐ Concentration of CH_4 in produced
- ☐ Concentration of CO_2 in produced natural

natural gas

- ☐ Report CO_2 emissions from all open ended lines (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CH_4 emissions from all open ended lines (standard cubic feet)
- ☐ Total number of components found leaking

21. Pressure Relief Valves

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CO_2 emissions from all pressure relief valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CH_4 emissions from all pressure relief valves (standard cubic feet)
- ☐ Total number of components found leaking

22. Pumps

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CO_2 emissions from all pumps (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CH_4 emissions from all pumps (standard cubic feet)
- ☐ Total number of components found leaking

23. Flanges

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CO_2 emissions from all flanges (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CH_4 emissions from all flanges (standard cubic feet)
- ☐ Total number of components found leaking

24. Instruments

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CO_2 emissions from all instruments (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CH_4 emissions from all instruments (standard cubic feet)
- ☐ Total number of components found leaking

25. Loading Arms

- ☐ Concentration of CH_4 in produced
- ☐ Concentration of CO_2 in produced natural

natural gas

- ☐ Report CO_2 emissions from all loading arms (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ gas
- ☐ Report CH_4 emissions from all loading arms (standard cubic feet)
- ☐ Total number of components found leaking

26. Stuffing Boxes

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CO_2 emissions from all stuffing boxes (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CH_4 emissions from all stuffing boxes (standard cubic feet)
- ☐ Total number of components found leaking

27. Compressor Seals

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CO_2 emissions from all compressor seals (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CH_4 emissions from all compressor seals (standard cubic feet)
- ☐ Total number of components found leaking

28. Dump Lever Arms

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CO_2 emissions from all dump lever arms (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CH_4 emissions from all dump lever arms (standard cubic feet)
- ☐ Total number of components found leaking

29. Breather Caps

- ☐ Concentration of CH_4 in produced natural gas
- ☐ Report CO_2 emissions from all breather caps (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in produced natural gas
- ☐ Report CH_4 emissions from all breather caps (standard cubic feet)
- ☐ Total number of components found leaking

30. Stationary or Portable Fuel Combustion Emissions

- ☐ Cumulative number of external fuel combustion units with a rated heat capacity equal to or less than 5 MMBtu/hr, by type of unit
- ☐ Cumulative number of external fuel combustion units with a rated heat capacity larger than 5 MMBtu/hr, by type of unit
- ☐ Cumulative emissions from external fuel combustion units with a rated heat capacity larger than 5 MMBtu/hr, by type of unit (cubic feet)
- ☐ Cumulative volume of fuel combusted in external fuel combustion units with a rated heat capacity larger than 5 MMBtu/hr, by fuel type (cubic feet)
- ☐ Cumulative number of all internal combustion units, by type of units
- ☐ Cumulative emissions from internal combustion units, by type of unit (cubic feet)
- ☐ Cumulative mass/volume of fuel combusted in internal combustion units, by fuel type
- ☐ Concentration of gas hydrocarbon constituents (such as methane, ethane, propane, butane and pentanes plus)

Note: This monitoring checklist does not include changes from the 12/23/11 final rule 76 FR 80554 (Technical Revisions and Clarifications to subpart A and subpart W), or corrections from the pending proposed rule, "2012 Technical Corrections, Clarifying and Other Amendments to the Greenhouse Gas Reporting Rule, and Proposed Confidentiality Determinations for Certain Data Elements of the Fluorinated Gas Source Category." EPA is working to update these checklists. Additional information on the subpart W rules can be found at http://www.epa.gov/climatechange/emissions/subpart/w.html. Reporters should refer to the e-CFR for the final rule (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9415fad5f1c7ea4d940d308e1ea74e11&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl).

Petroleum and Natural Gas Systems Monitoring Checklist for Onshore Natural Gas Processing

EPA United States Environmental Protection Agency

Final Rule: Mandatory Reporting of Greenhouse Gases (40 CFR Part 98)

What must be monitored?

If emissions are going to flares, need data elements under the source flare stacks.

Record these parameters on an annual basis, unless specified otherwise.

1. Reciprocating Compressor Rod Packing Venting

Record emissions at each reciprocating compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Reciprocating Compressor Emissions in Operating Mode:

- ☐ Rod packing venting from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the compressor is in operating mode (hours)
- ☐ Annual throughput (million standard cubic feet per day)
- ☐ Mole fraction of GHG in the vent gas

Reciprocating Compressors Emissions in Standby Pressurized Mode:

- ☐ Blowdown vent emissions from
- ☐ Total time the reciprocating compressor is

reciprocating compressor in standby pressurized mode (standard cubic feet)

☐ Mole fraction of GHG in the vent gas

in standby, pressurized mode (hours)

Reciprocating Compressors in Shutdown, Depressurized Mode:

☐ Unit isolation valve emissions from reciprocating compressor in shutdown depressurized mode (standard cubic feet)

☐ Mole fraction of GHG in the vent gas

☐ Total time the reciprocating compressor is in shutdown, depressurized mode (hours)

Record emission factors for reciprocating compressors in each mode.

☐ Total annual reciprocating compressor emissions in operating mode (cubic feet)

☐ Total annual reciprocating compressor emissions in shut down, depressurized mode (cubic feet)

☐ Total number of compressors measured in standby, pressurized mode

☐ Emission factor for rod packing vent emission in operating mode (cubic feet per hour)

☐ Emission factor for blowdown vent emissions in standby pressurized mode (cubic feet per hour)

☐ Total annual reciprocating compressor emissions in standby, pressurized mode (cubic feet)

☐ Total number of compressors measured in operating mode

☐ Total number of compressors measured in shutdown, depressurized mode

☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)

☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each reciprocating compressor in all modes and total annual emissions.

☐ Concentration of CH_4 in

☐ Concentration of CO_2 in produced/feed

produced/feed natural gas for reciprocating compressor in onshore natural gas processing facilities

natural gas for reciprocating compressor in onshore natural gas processing facilities

- ☐ Total time the reciprocating compressor is in standby, pressurized mode in reporting year (hours)
- ☐ Total time the reciprocating compressor is in shutdown, depressurized mode in reporting year (hours)
- ☐ Total annual compressor emission from all modes of operation (standard cubic feet)
- ☐ Total time the compressor is in operating mode in reporting year (hours)

2. Centrifugal Compressor Wet Seal Degassing Venting

Record emissions at each centrifugal compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Centrifugal Compressor Emissions in Operating Mode:

- ☐ Wet seal oil degassing vents emissions from centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the centrifugal compressor is in operating mode (hours)
- ☐ Number of wet seals connected to the degassing vent
- ☐ Type of meters used for making measurements
- ☐ Fraction of operating time wet seal degassing vent gas is sent to vapor recovery or fuel gas
- ☐ Mole fraction of GHG in the vent gas
- ☐ Annual throughput (million standard cubic feet per day)

Centrifugal Compressors in Not-operating, Depressurized Mode:

- ☐ Unit isolation valve emissions from centrifugal compressor in shutdown depressurized mode (standard cubic feet)
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode (hours)
- ☐ Mole fraction of GHG in the vent gas

Record emission factors for centrifugal compressors in each mode.

- ☐ Total annual emissions from all centrifugal compressor in operating mode (cubic feet)
- ☐ Total annual emissions from all centrifugal compressor in shut down, depressurized mode (cubic feet)
- ☐ Total number of centrifugal compressors measured in operating mode
- ☐ Total number of centrifugal compressors measured in shutdown, depressurized mode
- ☐ Emission factor for wet seal degassing vent in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)
- ☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each centrifugal compressor in all modes and total annual emissions.

- ☐ Concentration of CH_4 in produced/feed natural gas for centrifugal compressor in onshore natural gas processing facilities
- ☐ Concentration of CO_2 in produced/feed natural gas for centrifugal compressor in onshore natural gas processing facilities
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode in reporting year (hours)
- ☐ Total annual centrifugal compressor emission from all modes of operation (standard cubic feet)
- ☐ Total time the centrifugal compressor is in operating mode in reporting year (hours)

3. Blowdown Vents

- ☐ Number of repetitive blowdowns for each equipment type of a unique volume
- ☐ Total volume of blowdown equipment chambers (including pipelines, compressors and vessels) between isolation valves (cubic feet)
- ☐ Actual temperature in the blowdown equipment chamber
- ☐ Actual pressure in the blowdown equipment chamber (psia)

(°F)

☐ Emissions per equipment type (cubic feet)

4. Dehydrator Vents

For glycol dehydrator with a throughput greater than or equal to 0.4 million cubic feet per day:

☐ Feed natural gas flow rate (million standard cubic feet per day)

☐ Feed natural gas water content

☐ Outlet natural gas water content

☐ Absorbent circulation pump type (natural gas pneumatic/air pneumatic/ electric)

☐ Absorbent circulation rate

☐ Absorbent type (TEG/DEG/EG)

☐ Use of stripping natural gas (Y/N)

☐ Use of flash tank separator (Y/N)

☐ Total time of operation (hours)

☐ Wet natural gas temperature (°F)

☐ Wet natural gas composition

☐ Wet natural gas pressure (psig)

☐ Concentration of CH_4 in natural gas

☐ Concentration of CO_2 in natural gas

☐ Vent gas controls used

For glycol dehydrator with a throughput less than to 0.4 million standard cubic feet per year:

☐ Count of glycol dehydrators

☐ Vent gas controls used

For absorbent desiccant dehydrators:

☐ Count of desiccant dehydrators

☐ Vent gas controls used

☐ Time between refilling (days)

☐ Pressure of the gas (psia)

☐ Height of the dehydrator vessel (ft)

☐ Inside diameter of the vessel (ft)

☐ Percent of packed vessel volume that is gas

5. Acid Gas Removal (AGR) Vent Stacks

If using Calculation Methodology 1:

- ☐ Total throughput into the AGR unit and/or total throughput out of the AGR unit (cubic feet per year)
- ☐ Volume fraction of CO_2 content in the vent from the AGR unit
- ☐ Emissions recovered and transferred outside the facility (cubic feet)

If using Calculation Methodology 2:

- ☐ Total throughput flowing out of the AGR unit at actual conditions (cubic feet)
- ☐ Volume fraction of CO_2 content in vent gas from the AGR unit
- ☐ Emissions recovered and transferred outside the facility (cubic feet)

If using Calculation Methodology 3:

- ☐ Total throughput through the AGR unit at actual conditions (cubic feet)
- ☐ Volume fraction of CO_2 content in natural gas into the AGR unit
- ☐ Volume fraction of CO_2 content in natural gas out of the AGR unit
- ☐ Actual pressure (psia)
- ☐ Actual Temperature (°F)
- ☐ Emissions recovered and transferred outside the facility (cubic feet)

If using Calculation Methodology 4:

- ☐ Natural gas feed temperature
- ☐ Natural gas feed pressure
- ☐ Natural gas flow rate
- ☐ Acid gas content of feed natural gas
- ☐ Unit operating hours, excluding downtime for maintenance or standby
- ☐ Acid gas content of outlet natural gas

- ☐ Solvent pressure
- ☐ Solvent circulation rate
- ☐ Solvent weight
- ☐ Exit temperature of natural gas
- ☐ Solvent temperature

6. Flare Stack Emissions

- ☐ Continuous flow monitor on flare (Y/N)
- ☐ Volume of gas sent to flare annually (cubic feet)
- ☐ Flare combustion efficiency (98% if manufacturer data not available)
- ☐ Mole fraction of gas hydrocarbon constituents (such as methane, ethane, propane, butane, and pentanes-plus)
- ☐ Actual Process Pressure (psia)
- ☐ Continuous gas analyzer on the gas to the flare (Y/N)
- ☐ Percent of gas sent to un-lit flare
- ☐ Mole fraction of CO_2 in gas to the flare
- ☐ Actual Process Temperature (°F)

7. Valves

- ☐ Concentration of CH_4 in feed natural gas
- ☐ Report CO_2 emissions from all valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in feed natural gas
- ☐ Report CH_4 emissions from all valves (standard cubic feet)
- ☐ Total number of components found leaking

8. Connectors

- ☐ Concentration of CH_4 in feed natural gas
- ☐ Report CO_2 emissions from all connectors (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Concentration of CO_2 in feed natural gas
- ☐ Report CH_4 emissions from all connectors (standard cubic feet)
- ☐ Total number of components found leaking

9. Open Ended Lines

- ☐ Concentration of CH_4 in feed natural gas
- ☐ Concentration of CO_2 in feed natural gas
- ☐ Report CO_2 emissions from all open ended lines (standard cubic feet)
- ☐ Report CH_4 emissions from all open ended lines (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

10. Pressure Relief Valves

- ☐ Concentration of CH_4 in feed natural gas
- ☐ Concentration of CO_2 in feed natural gas
- ☐ Report CO_2 emissions from all pressure relief valves (standard cubic feet)
- ☐ Report CH_4 emissions from all pressure relief valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

11. Meters

- ☐ Concentration of CH_4 in feed natural gas
- ☐ Concentration of CO_2 in feed natural gas
- ☐ Report CO_2 emissions from all meters (standard cubic feet)
- ☐ Report CH_4 emissions from all meters (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

Note: This monitoring checklist does not include changes from the 12/23/11 final rule 76 FR 80554 (Technical Revisions and Clarifications to subpart A and subpart W), or corrections from the pending proposed rule, "2012 Technical Corrections, Clarifying and Other Amendments to the Greenhouse Gas Reporting Rule, and Proposed Confidentiality Determinations for Certain Data Elements of the Fluorinated Gas Source Category." EPA is working to update these checklists. Additional information on the subpart W rules can be found at http://www.epa.gov/climatechange/emissions/subpart/w.html. Reporters should refer to the e-CFR for the final rule (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9415fad5f1c7ea4d940d308e1ea74e11&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl).

Petroleum and Natural Gas Systems Monitoring Checklist for Onshore Natural Gas Transmission

EPA United States Environmental Protection Agency

Final Rule: Mandatory Reporting of Greenhouse Gases (40 CFR Part 98)

What must be monitored?

If emissions are going to flares, need data elements under the source flare stacks (see Monitoring Checklist for Onshore Petroleum and Natural Gas Production).

Record these parameters on an annual basis, unless specified otherwise.

1. Reciprocating Compressor Rod Packing Venting

Record emissions at each reciprocating compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Reciprocating Compressor Emissions in Operating Mode:

- ☐ Rod packing venting from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the compressor is in operating mode (hours)
- ☐ Annual throughput (million standard cubic feet per day)
- ☐ Mole fraction of GHG in the vent gas

Reciprocating Compressors Emissions in Standby Pressurized Mode:

- ☐ Blowdown vent emissions from
- ☐ Total time the reciprocating compressor is

reciprocating compressor in standby pressurized mode (standard cubic feet)

in standby, pressurized mode (hours)

- ☐ Mole fraction of GHG in the vent gas

Reciprocating Compressors in Shutdown, Depressurized Mode:

- ☐ Unit isolation valve emissions from reciprocating compressor in shutdown depressurized mode (standard cubic feet)
- ☐ Total time the reciprocating compressor is in shutdown, depressurized mode (hours)
- ☐ Mole fraction of GHG in the vent gas

Record emission factors for reciprocating compressors in each mode.

- ☐ Total annual reciprocating compressor emissions in operating mode (cubic feet)
- ☐ Total annual reciprocating compressor emissions in standby, pressurized mode (cubic feet)
- ☐ Total annual reciprocating compressor emissions in shut down, depressurized mode (cubic feet)
- ☐ Total number of compressors measured in operating mode
- ☐ Total number of compressors measured in standby, pressurized mode
- ☐ Total number of compressors measured in shutdown, depressurized mode
- ☐ Emission factor for rod packing vent emission in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in standby pressurized mode (cubic feet per hour)
- ☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each reciprocating compressor in all modes and total annual emissions.

- ☐ Total annual compressor emission from all modes of operation
- ☐ Total time the compressor is in operating mode in reporting year (hours)

(standard cubic feet)

- ☐ Total time the reciprocating compressor is in standby, pressurized mode in reporting year (hours)
- ☐ Total time the reciprocating compressor is in shutdown, depressurized mode in reporting year (hours)

2. Centrifugal Compressor Wet Seal Degassing Venting

Record emissions at each centrifugal compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Centrifugal Compressor Emissions in Operating Mode:

- ☐ Wet seal oil degassing vents emissions from centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the centrifugal compressor is in operating mode (hours)
- ☐ Number of wet seals connected to the degassing vent
- ☐ Type of meters used for making measurements
- ☐ Fraction of operating time wet seal degassing vent gas is sent to vapor recovery or fuel gas
- ☐ Mole fraction of GHG in the vent gas
- ☐ Annual throughput (million standard cubic feet per day)

Centrifugal Compressors in Not-operating, Depressurized Mode:

- ☐ Unit isolation valve emissions from centrifugal compressor in shutdown depressurized mode (standard cubic feet)
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode (hours)
- ☐ Mole fraction of GHG in the vent gas

Record emission factors for centrifugal compressors in each mode.

- ☐ Total annual emissions from all centrifugal compressor in operating mode (cubic feet)
- ☐ Total annual emissions from all centrifugal compressor in shut down, depressurized mode (cubic feet)

- ☐ Total number of centrifugal compressors measured in operating mode
- ☐ Total number of centrifugal compressors measured in shutdown, depressurized mode
- ☐ Emission factor for wet seal degassing vent in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)
- ☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each centrifugal compressor in all modes and total annual emissions.

- ☐ Total annual centrifugal compressor emission from all modes of operation (standard cubic feet)
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode in reporting year (hours)
- ☐ Total time the centrifugal compressor is in operating mode in reporting year (hours)

3. Transmission Storage Tanks

- ☐ Scrubber dump valve emissions (cubic feet)

4. Blowdown Vents

- ☐ Number of repetitive blowdowns for each equipment type of a unique volume
- ☐ Total volume of blowdown equipment chambers (including pipelines, compressors and vessels) between isolation valves (cubic feet)
- ☐ Actual temperature in the blowdown equipment chamber (°F)
- ☐ Actual pressure in the blowdown equipment chamber (psia)
- ☐ Emissions per equipment type (cubic feet)

5. Natural Gas Pneumatic Device Venting

- ☐ Actual and estimated counts of high bleed devices
- ☐ Actual and estimated counts of low bleed devices
- ☐ Actual and estimated counts of intermittent bleed devices

6. Connectors

- ☐ Report CO_2 emissions from all connectors (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Report CH_4 emissions from all connectors (standard cubic feet)
- ☐ Total number of components found leaking

7. Valves

- ☐ Report CO_2 emissions from all valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Report CH_4 emissions from all valves (standard cubic feet)
- ☐ Total number of components found leaking

8. Pressure Relief Valves

- ☐ Report CO_2 emissions from all pressure relief valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Report CH_4 emissions from all pressure relief valves (standard cubic feet)
- ☐ Total number of components found leaking

9. Meters

- ☐ Report CO_2 emissions from all meters (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Report CH_4 emissions from all meters (standard cubic feet)
- ☐ Total number of components found leaking

10. Open Ended Lines

- ☐ Report CO_2 emissions from all
- ☐ Report CH_4 emissions from all open ended

	open ended lines (standard cubic feet)		lines (standard cubic feet)
☐	Operating time of leaking component (hours)	☐	Total number of components found leaking

Note: This monitoring checklist does not include changes from the 12/23/11 final rule 76 FR 80554 (Technical Revisions and Clarifications to subpart A and subpart W), or corrections from the pending proposed rule, "2012 Technical Corrections, Clarifying and Other Amendments to the Greenhouse Gas Reporting Rule, and Proposed Confidentiality Determinations for Certain Data Elements of the Fluorinated Gas Source Category." EPA is working to update these checklists. Additional information on the subpart W rules can be found at http://www.epa.gov/climatechange/emissions/subpart/w.html. Reporters should refer to the e-CFR for the final rule (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9415fad5f1c7ea4d940d308e1ea74e11&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl).

Petroleum and Natural Gas Systems Monitoring Checklist for Underground Natural Gas Storage

United States Environmental Protection Agency

Final Rule: Mandatory Reporting of Greenhouse Gases (40 CFR Part 98)

What must be monitored?

If emissions are going to flares, need data elements under the source flare stacks (see Monitoring Checklist for Onshore Petroleum and Natural Gas Production).

Record these parameters on an annual basis, unless specified otherwise.

1. Reciprocating Compressor Rod Packing Venting

Record emissions at each reciprocating compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Reciprocating Compressor Emissions in Operating Mode:

- ☐ Rod packing venting from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the compressor is in operating mode (hours)
- ☐ Annual throughput (million standard cubic feet per day)
- ☐ Mole fraction of GHG in the vent gas

Reciprocating Compressors Emissions in Standby Pressurized Mode:

- ☐ Blowdown vent emissions from
- ☐ Total time the reciprocating compressor is

reciprocating compressor in standby pressurized mode (standard cubic feet)

☐ Mole fraction of GHG in the vent gas

in standby, pressurized mode (hours)

Reciprocating Compressors in Shutdown, Depressurized Mode:

☐ Unit isolation valve emissions from reciprocating compressor in shutdown depressurized mode (standard cubic feet)

☐ Mole fraction of GHG in the vent gas

☐ Total time the reciprocating compressor is in shutdown, depressurized mode (hours)

Record emission factors for reciprocating compressors in each mode.

☐ Total annual reciprocating compressor emissions in operating mode (cubic feet)

☐ Total annual reciprocating compressor emissions in shut down, depressurized mode (cubic feet)

☐ Total number of compressors measured in standby, pressurized mode

☐ Emission factor for rod packing vent emission in operating mode (cubic feet per hour)

☐ Emission factor for blowdown vent emissions in standby pressurized mode (cubic feet per hour)

☐ Total annual reciprocating compressor emissions in standby, pressurized mode (cubic feet)

☐ Total number of compressors measured in operating mode

☐ Total number of compressors measured in shutdown, depressurized mode

☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)

☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each reciprocating compressor in all modes and total annual emissions.

☐ Total annual compressor emission

☐ Total time the compressor is in operating

from all modes of operation (standard cubic feet)

- ☐ Total time the reciprocating compressor is in standby, pressurized mode in reporting year (hours)

mode in reporting year (hours)

- ☐ Total time the reciprocating compressor is in shutdown, depressurized mode in reporting year (hours)

2. Centrifugal Compressor Wet Seal Degassing Venting

Record emissions at each centrifugal compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Centrifugal Compressor Emissions in Operating Mode:

- ☐ Wet seal oil degassing vents emissions from centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the centrifugal compressor is in operating mode (hours)
- ☐ Type of meters used for making measurements
- ☐ Mole fraction of GHG in the vent gas
- ☐ Blowdown vent emissions centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Number of wet seals connected to the degassing vent
- ☐ Fraction of operating time wet seal degassing vent gas is sent to vapor recovery or fuel gas
- ☐ Annual throughput (million standard cubic feet per day)

Centrifugal Compressors in Not-operating, Depressurized Mode:

- ☐ Unit isolation valve emissions from centrifugal compressor in shutdown depressurized mode (standard cubic feet)
- ☐ Mole fraction of GHG in the vent gas
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode (hours)

Record emission factors for centrifugal compressors in each mode.

- ☐ Total annual emissions from all centrifugal compressor in operating mode (cubic feet)
- ☐ Total annual emissions from all centrifugal compressor in shut down, depressurized mode (cubic feet)
- ☐ Total number of centrifugal compressors measured in operating mode
- ☐ Total number of centrifugal compressors measured in shutdown, depressurized mode
- ☐ Emission factor for wet seal degassing vent in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)
- ☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each centrifugal compressor in all modes and total annual emissions.

- ☐ Total annual centrifugal compressor emission from all modes of operation (standard cubic feet)
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode in reporting year (hours)
- ☐ Total time the centrifugal compressor is in operating mode in reporting year (hours)

3. Natural Gas Pneumatic Device Venting

- ☐ Actual and estimated counts of high bleed devices
- ☐ Actual and estimated counts of low bleed devices
- ☐ Actual and estimated counts of intermittent bleed devices

4. Connectors

- ☐ Report CO_2 emissions from all connectors (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Report CH_4 emissions from all connectors (standard cubic feet)
- ☐ Total number of components found leaking

5. Valves

- ☐ Report CO_2 emissions from all valves (standard cubic feet)
- ☐ Report CH_4 emissions from all valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

6. Pressure Relief Valves

- ☐ Report CO_2 emissions from all pressure relief valves (standard cubic feet)
- ☐ Report CH_4 emissions from all pressure relief valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

7. Meters

- ☐ Report CO_2 emissions from all meters (standard cubic feet)
- ☐ Report CH_4 emissions from all meters (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

8. Open Ended Lines

- ☐ Report CO_2 emissions from all open ended lines (standard cubic feet)
- ☐ Report CH_4 emissions from all open ended lines (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

Note: This monitoring checklist does not include changes from the 12/23/11 final rule 76 FR 80554 (Technical Revisions and Clarifications to subpart A and subpart W), or corrections from the pending proposed rule, "2012 Technical Corrections, Clarifying and Other Amendments to the Greenhouse Gas Reporting Rule, and Proposed Confidentiality Determinations for Certain Data Elements of the Fluorinated Gas Source Category." EPA is working to update these checklists. Additional information on the subpart W rules can be found at http://www.epa.gov/climatechange/emissions/subpart/w.html. Reporters should refer to the e-CFR for the final rule (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9415fad5f1c7ea4d940d308e1ea74e11&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl).

Petroleum and Natural Gas Systems Monitoring Checklist for Natural Gas Distribution

United States Environmental Protection Agency

Final Rule: Mandatory Reporting of Greenhouse Gases (40 CFR Part 98)

What must be monitored?

If emissions are going to flares, need data elements under the source flare stacks (see Monitoring Checklist for Onshore Petroleum and Natural Gas Production).

Record these parameters on an annual basis, unless specified otherwise.

1. Above Ground Meters and Regulators at Custody Transfer City Gate Stations

- ☐ Number of custody transfer gate stations
- ☐ Total number of meter runs at all above grade M&R city gate stations at custody transfer

A. Connectors

- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking
- ☐ Report CO_2 emissions from all connectors (standard cubic feet)
- ☐ Report CH_4 emissions from all connectors (standard cubic feet)

B. Block Valves

- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking
- ☐ Report CO_2 emissions from all block valves (standard cubic feet)
- ☐ Report CH_4 emissions from all block valves (standard cubic feet)

C. Control Valves

- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking
- ☐ Report CO_2 emissions from all control valves (standard cubic feet)
- ☐ Report CH_4 emissions from all control valves (standard cubic feet)

D. Pressure Relief Valves

- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking
- ☐ Report CO_2 emissions from all pressure relief valves (standard cubic feet)
- ☐ Report CH_4 emissions from all pressure relief valves (standard cubic feet)

E. Orifice Meters

- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking
- ☐ Report CO_2 emissions from all orifice meters (standard cubic feet)
- ☐ Report CH_4 emissions from all orifice meters (standard cubic feet)

F. Regulators

- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking
- ☐ Report CO_2 emissions from all regulators (standard cubic feet)
- ☐ Report CH_4 emissions from all regulators (standard cubic feet)

G. Open Ended Lines

- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking
- ☐ Report CO_2 emissions from all open ended lines (standard cubic feet)
- ☐ Report CH_4 emissions from all open ended lines (standard cubic feet)

2. Above Ground Meters and Regulators at Non-custody Transfer City Gate Stations

- ☐ Number of non-custody transfer gate stations
- ☐ Number of meter runs at non custody transfer city gate stations.
- ☐ Custody transfer gate station meter run leak factor
- ☐ Total time the component was fond leaking and operational (hours)

3. Below Ground Meters and Regulators and Vault Equipment Leaks

- ☐ Number of stations with inlet pressure greater than 300 psig
- ☐ Number of stations with inlet pressure between 100 and 300 psig.
- ☐ Number of stations with inlet pressure less than 300 psig
- ☐ Total time the component was found leaking and operational (hours)

4. Pipeline Main Equipment Leaks

- ☐ Number of miles of mains
- ☐ Total time the component was found leaking and operational (hours)

5. Service Line Equipment Leaks

- ☐ Number of services
- ☐ Total time the component was found leaking and operational (hours)

6. Stationary Fuel Combustion Emissions

- ☐ Cumulative number of external fuel combustion units with a rated heat capacity equal to or less than 5 MMBtu/hr, by type of unit
- ☐ Cumulative number of external fuel combustion units with a rated heat capacity larger than 5 MMBtu/hr, by type of unit
- ☐ Cumulative emissions from external fuel combustion units with a rated heat capacity larger than 5 MMBtu/hr, by type of unit (cubic feet)
- ☐ Cumulative volume of fuel combusted in external fuel combustion units with a rated heat capacity larger than 5 MMBtu/hr, by fuel type (cubic feet)
- ☐ Cumulative number of all internal combustion units, by type of units
- ☐ Cumulative emissions from internal combustion units, by type of unit (cubic feet)
- ☐ Cumulative mass/volume of fuel combusted in internal combustion units, by fuel type
- ☐ Concentration of gas hydrocarbon constituents (such as methane, ethane, propane, butane and pentanes plus)

Note: This monitoring checklist does not include changes from the 12/23/11 final rule 76 FR 80554 (Technical Revisions and Clarifications to subpart A and subpart W), or corrections from the pending proposed rule, "2012 Technical Corrections, Clarifying and Other Amendments to the Greenhouse Gas Reporting Rule, and Proposed Confidentiality Determinations for Certain Data Elements of the Fluorinated Gas Source Category." EPA is working to update these checklists. Additional information on the subpart W rules can be found at http://www.epa.gov/climatechange/emissions/subpart/w.html. Reporters should refer to the e-CFR for the final rule (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9415fad5f1c7ea4d940d308e1ea74e11&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl).

Petroleum and Natural Gas Systems Monitoring Checklist for LNG Storage

United States Environmental Protection Agency

Final Rule: Mandatory Reporting of Greenhouse Gases (40 CFR Part 98)

What must be monitored?

If emissions are going to flares, need data elements under the source flare stacks (see Monitoring Checklist for Onshore Petroleum and Natural Gas Production).

Record these parameters on an annual basis, unless specified otherwise.

1. Reciprocating Compressor Rod Packing Venting

Record emissions at each reciprocating compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Reciprocating Compressor Emissions in Operating Mode:

- ☐ Rod packing venting from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the compressor is in operating mode (hours)
- ☐ Annual throughput (million standard cubic feet per day)
- ☐ Mole fraction of GHG in the vent gas

Reciprocating Compressors Emissions in Standby Pressurized Mode:

- ☐ Blowdown vent emissions from reciprocating compressor in standby pressurized mode (standard cubic feet)
- ☐ Total time the reciprocating compressor is in standby, pressurized mode (hours)

- ☐ Mole fraction of GHG in the vent gas

Reciprocating Compressors in Shutdown, Depressurized Mode:

- ☐ Unit isolation valve emissions from reciprocating compressor in shutdown depressurized mode (standard cubic feet)
- ☐ Mole fraction of GHG in the vent gas
- ☐ Total time the reciprocating compressor is in shutdown, depressurized mode (hours)

Record emission factors for reciprocating compressors in each mode.

- ☐ Total annual reciprocating compressor emissions in operating mode (cubic feet)
- ☐ Total annual reciprocating compressor emissions in shut down, depressurized mode (cubic feet)
- ☐ Total number of compressors measured in standby, pressurized mode
- ☐ Emission factor for rod packing vent emission in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in standby pressurized mode (cubic feet per hour)
- ☐ Total annual reciprocating compressor emissions in standby, pressurized mode (cubic feet)
- ☐ Total number of compressors measured in operating mode
- ☐ Total number of compressors measured in shutdown, depressurized mode
- ☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)
- ☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each reciprocating compressor in all modes and total annual emissions.

- ☐ Total annual compressor emission from all modes of operation
- ☐ Total time the compressor is in operating mode in reporting year (hours)

(standard cubic feet)

- ☐ Total time the reciprocating compressor is in standby, pressurized mode in reporting year (hours)
- ☐ Total time the reciprocating compressor is in shutdown, depressurized mode in reporting year (hours)

2. Centrifugal Compressor Wet Seal Degassing Venting

Record emissions at each centrifugal compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Centrifugal Compressor Emissions in Operating Mode:

- ☐ Wet seal oil degassing vents emissions from centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the centrifugal compressor is in operating mode (hours)
- ☐ Number of wet seals connected to the degassing vent
- ☐ Type of meters used for making measurements
- ☐ Fraction of operating time wet seal degassing vent gas is sent to vapor recovery or fuel gas
- ☐ Mole fraction of GHG in the vent gas
- ☐ Annual throughput (million standard cubic feet per day)

Centrifugal Compressors in Not-operating, Depressurized Mode:

- ☐ Unit isolation valve emissions from centrifugal compressor in shutdown depressurized mode (standard cubic feet)
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode (hours)
- ☐ Mole fraction of GHG in the vent gas

Record emission factors for centrifugal compressors in each mode.

- ☐ Total annual emissions from all
- ☐ Total annual emissions from all

centrifugal compressor in operating mode (cubic feet)

centrifugal compressor in shut down, depressurized mode (cubic feet)

- ☐ Total number of centrifugal compressors measured in operating mode
- ☐ Total number of centrifugal compressors measured in shutdown, depressurized mode
- ☐ Emission factor for wet seal degassing vent in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)
- ☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record e emissions from each centrifugal compressor in all modes and total annual emissions.

- ☐ Total annual centrifugal compressor emission from all modes of operation (standard cubic feet)
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode in reporting year (hours)
- ☐ Total time the centrifugal compressor is in operating mode in reporting year (hours)

3. Valves

- ☐ Report CO_2 emissions from all valves (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Report CH_4 emissions from all valves (standard cubic feet)
- ☐ Total number of components found leaking

4. Pump Seals

- ☐ Report CO_2 emissions from all pump seals (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Report CH_4 emissions from all pump seals (standard cubic feet)
- ☐ Total number of components found leaking

5. Connectors

- ☐ Report CO_2 emissions from all connectors (standard cubic feet)
- ☐ Operating time of leaking
- ☐ Report CH_4 emissions from all connectors (standard cubic feet)
- ☐ Total number of components found leaking

component (hours)

6. Vapor Recovery Compressors

- ☐ Report CO_2 emissions from all vapor recovery compressors (standard cubic feet)
- ☐ Report CH_4 emissions from all vapor recovery compressors (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

7. Other Equipment

- ☐ Report CO_2 emissions from all other equipment (standard cubic feet)
- ☐ Report CH_4 emissions from all other equipment (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

Note: This monitoring checklist does not include changes from the 12/23/11 final rule 76 FR 80554 (Technical Revisions and Clarifications to subpart A and subpart W), or corrections from the pending proposed rule, "2012 Technical Corrections, Clarifying and Other Amendments to the Greenhouse Gas Reporting Rule, and Proposed Confidentiality Determinations for Certain Data Elements of the Fluorinated Gas Source Category." EPA is working to update these checklists. Additional information on the subpart W rules can be found at http://www.epa.gov/climatechange/emissions/subpart/w.html. Reporters should refer to the e-CFR for the final rule (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9415fad5f1c7ea4d940d308e1ea74e11&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl).

Petroleum and Natural Gas Systems Monitoring Checklist for LNG Import and Export

United States Environmental Protection Agency

Final Rule: Mandatory Reporting of Greenhouse Gases (40 CFR Part 98)

What must be monitored?

If emissions are going to flares, need data elements under the source flare stacks (see Monitoring Checklist for Onshore Petroleum and Natural Gas Production).

Record these parameters on an annual basis, unless specified otherwise.

1. Reciprocating Compressor Rod Packing Venting

Record emissions at each reciprocating compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Reciprocating Compressor Emissions in Operating Mode:

- ☐ Rod packing venting from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions from reciprocating compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the compressor is in operating mode (hours)
- ☐ Annual throughput (million standard cubic feet per day)
- ☐ Mole fraction of GHG in the vent gas

Reciprocating Compressors Emissions in Standby Pressurized Mode:

- ☐ Blowdown vent emissions from reciprocating compressor in standby pressurized mode (standard cubic
- ☐ Total time the reciprocating compressor is in standby, pressurized mode (hours)

feet)

- ☐ Mole fraction of GHG in the vent gas

Reciprocating Compressors in Shutdown, Depressurized Mode:

- ☐ Unit isolation valve emissions from reciprocating compressor in shutdown depressurized mode (standard cubic feet)
- ☐ Mole fraction of GHG in the vent gas
- ☐ Total time the reciprocating compressor is in shutdown, depressurized mode (hours)

Record emission factors for reciprocating compressors in each mode.

- ☐ Total annual reciprocating compressor emissions in operating mode (cubic feet)
- ☐ Total annual reciprocating compressor emissions in shut down, depressurized mode (cubic feet)
- ☐ Total number of compressors measured in standby, pressurized mode
- ☐ Emission factor for rod packing vent emission in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in standby pressurized mode (cubic feet per hour)
- ☐ Total annual reciprocating compressor emissions in standby, pressurized mode (cubic feet)
- ☐ Total number of compressors measured in operating mode
- ☐ Total number of compressors measured in shutdown, depressurized mode
- ☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)
- ☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each reciprocating compressor in all modes and total annual emissions.

- ☐ Total annual compressor emission from all modes of operation (standard cubic feet)
- ☐ Total time the compressor is in operating mode in reporting year (hours)

- ☐ Total time the reciprocating compressor is in standby, pressurized mode in reporting year (hours)
- ☐ Total time the reciprocating compressor is in shutdown, depressurized mode in reporting year (hours)

2. Centrifugal Compressor Wet Seal Degassing Venting

Record emissions at each centrifugal compressor in as-found mode. Each mode must be monitored at least once in any three consecutive calendar years.

Centrifugal Compressor Emissions in Operating Mode:

- ☐ Wet seal oil degassing vents emissions from centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Blowdown vent emissions centrifugal compressor in operational mode (standard cubic feet per hour)
- ☐ Total time the centrifugal compressor is in operating mode (hours)
- ☐ Number of wet seals connected to the degassing vent
- ☐ Type of meters used for making measurements
- ☐ Fraction of operating time wet seal degassing vent gas is sent to vapor recovery or fuel gas
- ☐ Mole fraction of GHG in the vent gas
- ☐ Annual throughput (million standard cubic feet per day)

Centrifugal Compressors in Not-operating, Depressurized Mode:

- ☐ Unit isolation valve emissions from centrifugal compressor in shutdown depressurized mode (standard cubic feet)
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode (hours)
- ☐ Mole fraction of GHG in the vent gas

Record emission factors for centrifugal compressors in each mode.

- ☐ Total annual emissions from all
- ☐ Total annual emissions from all

centrifugal compressor in operating mode (cubic feet)

centrifugal compressor in shut down, depressurized mode (cubic feet)

- ☐ Total number of centrifugal compressors measured in operating mode
- ☐ Total number of centrifugal compressors measured in shutdown, depressurized mode
- ☐ Emission factor for wet seal degassing vent in operating mode (cubic feet per hour)
- ☐ Emission factor for blowdown vent emissions in operating mode (cubic feet per hour)
- ☐ Emission factor for isolation valve in shutdown, depressurized mode (cubic feet per hour)

Record emissions from each centrifugal compressor in all modes and total annual emissions.

- ☐ Total annual centrifugal compressor emission from all modes of operation (standard cubic feet)
- ☐ Total time the centrifugal compressor is in shutdown, depressurized mode in reporting year (hours)
- ☐ Total time the centrifugal compressor is in operating mode in reporting year (hours)

3. Blowdown Vents

- ☐ Number of repetitive blowdowns for each equipment type of a unique volume
- ☐ Actual temperature in the blowdown equipment chamber (°F)
- ☐ Emissions per equipment type (cubic feet)
- ☐ Total volume of blowdown equipment chambers (including pipelines, compressors and vessels) between isolation valves (cubic feet)
- ☐ Actual pressure in the blowdown equipment chamber (psia)

4. Valves

- ☐ Report CO_2 emissions from all valves (standard cubic feet)
- ☐ Operating time of leaking
- ☐ Report CH_4 emissions from all other valves (standard cubic feet)
- ☐ Total number of components found leaking

component (hours)

5. Pump Seals

- ☐ Report CO_2 emissions from all pump seals (standard cubic feet)
- ☐ Report CH_4 emissions from all pump seals (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

6. Connectors

- ☐ Report CO_2 emissions from all connectors (standard cubic feet)
- ☐ Report CH_4 emissions from all other connectors (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

7. Vapor Recovery Compressors

- ☐ Report CO_2 emissions from all vapor recovery compressors (standard cubic feet)
- ☐ Report CH_4 emissions from all vapor recovery compressors (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking

8. Other Equipment

- ☐ Report CO_2 emissions from all other equipment (standard cubic feet)
- ☐ Report CH_4 emissions from all other equipment (standard cubic feet)
- ☐ Operating time of leaking component (hours)
- ☐ Total number of components found leaking