



Natural Gas STAR Methane Challenge Program: Supplementary Technical Information for ONE Future Commitment Option



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Introduction

This document provides additional details to augment the Natural Gas STAR Methane Challenge Program (“Methane Challenge”) ONE Future Emissions Intensity (ONE Future) Commitment Framework and Partnership Agreement documents released¹. This document provides information on how companies selecting the ONE Future Commitment Option will quantify emissions and reductions and report to the Methane Challenge Program, including Greenhouse Gas Reporting Program (GHGRP) and supplementary reporting data elements that will be used to track partner progress. Because companies selecting the ONE Future Commitment Option would need to quantify all of their methane emission sources, this document is intended to be comprehensive and cover all methane emitting sources covered in the GHGRP and the Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHGI).

Methane Challenge Program Reporting

The EPA will collect the following information from partner companies as part of annual reporting to provide context for participation in the Program and facilitate annual tracking of progress:

- List of included facilities that report to Subpart W (facility ID)
- List of included facilities not reporting to Subpart W (a process will be developed for generating a facility ID for facilities that do not report to Subpart W)
- List of facilities acquired/divested during the reporting year.

In the following sections of this document, for each emission source, the “Reporting” table summarizes the Data Elements the Methane Challenge Program will utilize to track partner company progress towards their commitments, including the following information:

- **Emission Source:** The partner company will provide information on all occurrences of methane emission sources across company/unit operations. Data collection will include both unmitigated sources and sources that have implemented mitigation options.
- **Quantification Method:** For each emission source, there is a corresponding method or methods to quantify methane emissions.
- **Data Elements Collected via Facility-Level Reporting:** Facilities not already reporting to Subpart W would report all Data Elements through a supplemental reporting mechanism. Facilities already reporting to Subpart W would provide only supplemental data elements through the supplemental reporting mechanism.

In addition, annual reports will provide an opportunity for reporting optional, qualitative information to provide context for their progress each year.

For reporting purposes, the Methane Challenge Program will utilize the same source definitions as Subpart W and the GHG Inventory (where applicable), and the segment and facility definitions from

¹ The Methane Challenge Program: ONE Future Emissions Intensity Commitment Framework can be found on the Natural Gas STAR Methane Challenge website at https://www3.epa.gov/gasstar/documents/MethaneChallenge_ONE_Future_Framework.pdf.



Subpart W². The exception will be Natural Gas Transmission Compression & Underground Natural Gas Storage facilities that do not report to Subpart W, which will be reported at an aggregated level by each partner company (see Appendix A for alternate facility definition for “Transmission Pipeline Company”)³.

Data will be reported at the facility level, except where specified. Annually, the EPA will collect company-specific information about activity data, methane emissions, and voluntary emission reductions as submitted by ONE Future Commitment Option partners and publicly release all non-confidential data submitted either to the Methane Challenge Program⁴ or through the GHGRP to track the progress of individual Partner companies in meeting their Program commitments. ONE Future will utilize each company’s total methane emissions data, calculated per the methodologies outlined in this document, to determine their respective methane emission intensity. Additional information on how ONE Future will use this information to track their partners’ individual and collective company progress is available on the ONE Future website: <http://www.onefuture.us/>.⁵

Emission Sources

Acid Gas Removal Vents

Applicable Segments:

- Production⁶, Gathering & Boosting⁷, and Processing⁸

Quantification Methods:

- GHGI segment specific EFs⁹

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Acid Gas Removal (AGR) vents	Actual count of AGR units	X
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the	Mitigation actions implemented to reduce methane emissions (list)	

² The EPA reserves the right to update the contents of this document at any time in order to maintain alignment with GHGRP or GHGI definitions and methodologies.

³ Throughout the document, references to “Natural Gas Transmission Compression & Underground Natural Gas Storage” will be assumed to include the Subpart W and alternate facility definitions.

⁴ All Methane Challenge supplemental data must be non-confidential.

⁵ The scope of this protocol is limited to CH₄ emissions intensity computation and progress tracking.

⁶ Throughout this document, “Production” will be used to refer to the Onshore Petroleum and Natural Gas Production segment, as defined in Appendix A.

⁷ Throughout this document, “Gathering and Boosting” will be used to refer to the Onshore Petroleum and Natural Gas Gathering and Boosting segment, as defined in Appendix A.

⁸ Throughout this document, “Processing” will be used to refer to the Onshore Natural Gas Processing segment, as defined in Appendix A.

⁹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-136: 2014 Data and CH₄ Emissions [Mg] for the Natural Gas Processing Stage



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
reporting year ¹⁰	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Associated Gas Venting & Flaring

Applicable Segments:

- Production

Quantification Methods:

- Subpart W - Calculation using volume of oil produced, gas to oil ratio (GOR), and volume of associated gas sent to sales; accounting for flare control as applicable¹¹

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Associated Gas Venting & Flaring	Volume of oil produced during venting/flaring	X
	Volume of associated gas sent to sales (scf)	X
	Actual count of wells venting associated gas	X
	Actual count of wells flaring associated gas	X
	Annual CH ₄ Emissions from Venting (mt CH ₄)	X
	Annual CH ₄ Emissions from Flaring (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ¹²	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Blowdowns - Distribution Pipeline

Applicable Segments:

- Distribution¹³

Quantification Methods:

- GHGI segment specific EFs¹⁴

Reporting:

¹⁰ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

¹¹ 40 CFR 98.233(m) and 40 CFR 98.233(n)

¹² As calculated per the specified emission quantification methodologies for each source.

¹³ Throughout this document, "Distribution" will be used to refer to the Natural Gas Distribution segment, as defined in Appendix A.

¹⁴ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-138: 2014 Data and CH₄ Emissions (Mg) for the Natural Gas Distribution Stage



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Routine maintenance: Pipeline Blowdowns	Miles of pipeline	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹⁵	Number of blowdowns that routed gas to a compressor or capture system for beneficial use, flare, or low-pressure system	
	Number of hot taps utilized that avoided the need to blowdown gas to the atmosphere	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Blowdowns - Transmission Pipeline (Between Compressor Stations)

Applicable Segments:

- Transmission Pipelines¹⁶

Quantification Methods:

- Subpart W - Calculation method using the volume of transmission pipeline segment between isolation valves and the pressure and temperature of the gas within the transmission pipeline¹⁷
- Subpart W - Calculation method using direct measurement of emissions using a flow meter¹⁸

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Transmission Pipeline Blowdowns (between Compressor Stations)	Actual count of blowdowns	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ¹⁹	Number of blowdowns that routed gas to:	
	A compressor or capture system for beneficial use	
	A flare	
	A low-pressure system	
	Number of hot taps utilized that avoided the need to blowdown gas to the atmosphere	
	Number of blowdowns utilizing other emissions control technique	

¹⁵ As calculated per the specified emission quantification methodologies for each source (partners wishing to quantify emissions reductions can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is).

¹⁶ Throughout this document, "Transmission Pipelines" will be used to refer to the Onshore Natural Gas Transmission Pipeline segment, as defined in Appendix A.

¹⁷ 98.233(i)(2)

¹⁸ 98.233(i)(3)

¹⁹ As calculated per the specified emission quantification methodologies for each source.



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
	(specify emissions control methodology) ²⁰	
	Emission reductions from voluntary action (mt CH ₄)	

Blowdown Vent Stacks

Applicable Segments:

- Gathering & Boosting, Processing, Transmission Compression²¹, and LNG Import/Export²²

Quantification Methods:

- Subpart W - Calculation method using engineering calculation method by equipment or event type²³
- Subpart W - Calculation method using direct measurement of emissions using a flow meter²⁴
- Alternate calculation method using actual event counts multiplied by the average unique physical volumes as calculated from all company-specific Subpart W facility events (for Processing and Transmission Compression segment facilities not reporting to Subpart W **only**)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Blowdown Vent Stacks	Actual count of blowdowns by equipment or event type	X
	Annual CH ₄ emissions by equipment or event type (mt CH ₄) (emissions calculated by equipment or event type)	X
	Annual total CH ₄ emissions calculated by flow meter (mt CH ₄) (emissions calculated using flow meters)	X
	Annual total CH ₄ emissions calculated using the alternate calculation method (mt CH ₄)	
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ²⁵	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Production Blowdowns

Applicable Segments:

²⁰ An example of another emissions control technique is the installation of mechanical or composite sleeves that avoided the need to blowdown gas.

²¹ Throughout this document, “Transmission Compression” will be used to refer to the Onshore Natural Gas Transmission Compression segment, as defined in Appendix A.

²² Throughout this document, “LNG Import/Export” will be used to refer to the LNG Import and Export Equipment segment, as defined in Appendix A.

²³ 98.233(i)(2)

²⁴ 98.233(i)(3)

²⁵ As calculated per the specified emission quantification methodologies for each source.



- Production

Quantification Methods:

- GHGI segment specific EFs^{26 27}

Emission Source ²⁸	Data Elements Collected via Facility-Level Reporting	GHGRP
Vessel Blowdowns	Actual count of blowdowns	
	Actual count of vessels	
	Annual CH ₄ Emissions (mt CH ₄)	
Compressor Blowdowns	Actual count of blowdowns	
	Actual count of compressors	
	Annual CH ₄ emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ²⁹	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions (Production)	
	Emission reductions from voluntary action (mt CH ₄)	

Combustion Units - Internal

Applicable Segments:

- Production, Gathering & Boosting, Distribution

Quantification Methods:

- Subpart W, as applicable based on fuel type - Calculation using fuel usage records and measured or estimated composition³⁰

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Internal combustion units	Actual count of internal fuel combustion units that are not compressor-drivers, with a rated heat capacity less than or equal to 1 mmBtu/hr	X
	Actual count of internal fuel combustion units that are not compressor-drivers, with a rated heat capacity greater than 1	X

²⁶ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-127: 2014 CH₄ Emissions from Petroleum Production Field Operations

²⁷ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-134: 2014 Data and Calculated CH₄ Potential Emissions [Mg] for the Natural Gas Production Stage

²⁸ Specific GHGI emission source names used

²⁹ Partners reducing the number of blowdowns should use the specified methodology to calculate methane emission reductions achieved. Partners reducing the volume of methane blown down can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

³⁰ 40 CFR 98.233(z)(1), 40 CFR 98.233(z)(2)



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
	million Btu per hour	
	Annual CH ₄ Emissions (mt CH ₄) for internal fuel combustion units that are not compressor-drivers, with a rated heat capacity greater than 1 million Btu per hour	X
	Actual count of internal fuel combustion units of any heat capacity that are compressor-drivers	X
	Annual CH ₄ Emissions (mt CH ₄) for internal fuel combustion units of any heat capacity that are compressor-drivers	X
Voluntary action to reduce methane emissions during the reporting year ³¹	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Combustion Units - External

Applicable Segments:

- Production, Gathering & Boosting, Distribution

Quantification Methods:

- Subpart W, as applicable based on fuel type - Calculation using fuel usage records and measured or estimated composition³²

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
External combustion units	Actual count of external fuel combustion units with a rated heat capacity less than or equal to 5 million Btu per hour	X
	Actual count of external fuel combustion units with a rated heat capacity greater than 5 million Btu per hour	X
	Annual CH ₄ Emissions (mt CH ₄) for external fuel combustion units with a rated heat capacity greater than 5 million Btu per hour	X
Voluntary action to reduce methane emissions during the reporting year ³³	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Combustion Units – Subpart C

Applicable Segments:

³¹ As calculated per the specified emission quantification methodologies for each source.

³² 40 CFR 98.233(z)(1), 40 CFR 98.233(z)(2)

³³ As calculated per the specified emission quantification methodologies for each source.



- Processing, Transmission Compression, Storage³⁴, LNG Storage³⁵, and LNG Import/Export

Quantification Methods:

- Subpart C methods, as applicable based on fuel type - Calculation using fuel usage as recorded or measured, fuel high heating value (HHV) default value or as calculated from measurements, and fuel-specific EF³⁶

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Individual combustion units (98.36(b))	Total number of combustion units	
	Annual CH ₄ Emissions (mt CH ₄) per combustion unit	X
Aggregation of combustion units (98.36(c)(1))	Total number of combustion units included in aggregated group	
	Total annual CH ₄ Emissions (mt CH ₄) per aggregation of units	X
Combustion units sharing a common stack or duct that is monitored by CO ₂ CEMS (98.36(c)(2))	Total number of combustion units sharing the common stack or duct	X
	Total annual CH ₄ Emissions (mt CH ₄) for all units sharing a common stack or duct	X
Combustion units served by a common fuel supply line (98.36(c)(3))	Total number of combustion units served by a common fuel supply line	
	Total annual CH ₄ Emissions (mt CH ₄) for all units served by a common fuel supply line	X
Voluntary action to reduce methane emissions during the reporting year ³⁷	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Centrifugal Compressors – Production and Gathering & Boosting

Applicable Segments:

- Production and Gathering & Boosting

Quantification Methods:

- Subpart W - Calculation using default population EF for compressors with wet seal oil degassing vents³⁸
- GHGI - Segment specific EFs³⁹ (for dry seal centrifugal compressors **only**)

³⁴ Throughout this document, “Storage” will be used to refer to the Underground Natural Gas Storage segment, as defined in Appendix A.

³⁵ Throughout this document, “LNG Storage” will be used to refer to the Liquefied Natural Gas (LNG) Storage segment, as defined in Appendix A.

³⁶ 40 CFR 98.33(c)

³⁷ As calculated per the specified emission quantification methodologies for each source.

³⁸ 40 CFR 98.233(o)(10)

³⁹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-134: 2014 Data and Calculated CH₄ Potential Emissions [Mg] for the Natural Gas Production Stage



Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Centrifugal compressors with wet seal oil degassing vents	Number of centrifugal compressors with wet seal oil degassing vents	X
	Annual CH ₄ emissions (mt CH ₄)	X
Centrifugal compressors with dry seals	Number of centrifugal compressors with dry seals	
	Annual CH ₄ emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁴⁰	Number of compressors routed to vapor recovery units	
	Number of compressors routed to flare	
	Number of compressors where source emissions are captured for fuel use or routed to a thermal oxidizer	
	Number of compressors utilizing other emissions control technique (specify emissions control methodology)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Centrifugal Compressors – Other Segments

Applicable Segments:

- Processing, Transmission Compression, Storage, LNG Storage, and LNG Import/Export

Quantification Methods:

- Subpart W - Individual compressor source “as found” measurements⁴¹
 - Operating mode: blowdown valve leakage and rod packing emissions
 - Not-operating-depressurized mode: isolation valve leakage
 - Site-specific EF⁴²
- Subpart W - Continuous monitoring⁴³
- Subpart W - Manifolder “as found” measurements⁴⁴
- Alternate calculation method using average company EF based on all company-specific Subpart W centrifugal compressor measurements (for Processing, Transmission Compression, Storage, and LNG Import/Export facilities not reporting to Subpart W **only**)

Reporting:

⁴⁰ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is. If the reduction option is to implement dry seals, partners should calculate reductions utilizing GHGI emissions calculation methods.

⁴¹ 40 CFR 98.233(o)(1)(i)

⁴² 40 CFR 98.233(o)(6)

⁴³ 40 CFR 98.233(o)(1)(ii)

⁴⁴ 40 CFR 98.233(o)(1)(iii)



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Centrifugal compressors	Actual count of centrifugal compressors with wet seals	X
	Actual count of centrifugal compressors with dry seals	X
	Actual count of manifolded groups of compressors with wet seals, isolation valves, or blowdown valves	X
	Actual count of compressors with wet seals, isolation valves, or blowdown valves that are routed to a flare	X
	Actual count of compressors with wet seals, isolation valves, and or blowdown valves that have vapor recovery	X
	Actual count of compressors with wet seals, isolation valves, or blowdown valves that are routed to a thermal oxidizer or emissions are captured for beneficial use	X
	Actual count of compressors utilizing the alternate calculation method	
	Annual CH ₄ emissions using the alternate calculation method (mt CH ₄)	
	Annual CH ₄ emissions vented to the atmosphere (mt CH ₄)	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁴⁵	Number of compressors routed to vapor recovery units	
	Number of compressors routed to flare	
	Number of compressors where source emissions are captured for fuel use or routed to a thermal oxidizer	
	Number of compressors utilizing other emissions control technique (specify emissions control methodology)	
	Emission reductions from voluntary action (mt CH ₄)	

Reciprocating Compressors – Production and Gathering and Boosting

Applicable Segments:

- Production and Gathering & Boosting

Quantification Methods:

- Subpart W - Calculation using default population EF for reciprocating compressors⁴⁶

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Reciprocating compressors	Number of reciprocating compressors	X
	Annual CH ₄ emissions (mt CH ₄)	X
Voluntary action to	Number of replaced reciprocating compressor rod packing	

⁴⁵ As calculated per the specified emission quantification methodologies for each source.

⁴⁶ 40 CFR 98.233(p)(10)



reduce methane emissions during the reporting year ⁴⁷	Number of compressors routed to vapor recovery units	
	Number of compressors routed to flare	
	Number of compressors where source emissions are captured for fuel use or routed to a thermal oxidizer	
	Number of compressors utilizing other emissions control technique (specify emissions control methodology)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Reciprocating Compressors – Other Segments

Applicable Segments:

- Processing, Transmission Compression, Storage, LNG storage, and LNG Import/Export

Quantification Methods:

- Subpart W - Individual compressor source “as found” measurements⁴⁸
 - Operating mode: blowdown valve leakage and rod packing emissions
 - Standby-pressurized mode: blowdown valve leakage
 - Not-operating-depressurized mode: isolation valve leakage
 - Site-specific EF⁴⁹
- Subpart W - Continuous monitoring⁵⁰
- Subpart W - Manifolder “as found” measurements⁵¹
- Alternate calculation method using average company EF based on all company-specific Subpart W centrifugal compressor measurements (for Processing, Transmission Compression, and LNG Import/Export facilities not reporting to Subpart W **only**)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Reciprocating compressors	Number of compressors with rod packing emissions vented to the atmosphere	X
	Number of manifolded groups of compressor sources: isolation valves, blowdown valves, and rod packing	X
	Number of compressors routing isolation valve leakage to flares, combustion units, or capture systems for beneficial use	X
	Number of compressors routing blowdown valve leakage to flares, combustion units, or capture systems for beneficial use	X
	Number of compressors routing rod packing vents to flares, combustion units, or capture systems for beneficial use	X

⁴⁷ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

⁴⁸ 40 CFR 98.233(p)(1)(i)

⁴⁹ 40 CFR 98.233(p)(6)

⁵⁰ 40 CFR 98.233(p)(1)(ii)

⁵¹ 40 CFR 98.233(p)(1)(iii)



	Annual CH ₄ emissions from flares and combustion units due to combustion of emissions from isolation valves, blowdown valves, and rod packing vents (mt CH ₄)	X
	Annual CH ₄ emissions vented to the atmosphere from isolation valves, blowdown valves, and rod packing (including estimated fraction of CH ₄ from manifolded compressor sources) (mt CH ₄)	X
	Actual count of compressors utilizing the alternate calculation method	
	Annual CH ₄ emissions using the alternate calculation method (mt CH ₄)	
	Annual CH ₄ emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁵²	Number of replaced reciprocating compressor rod packing	
	Number of compressors routed to vapor recovery units	
	Number of compressors routed to flare	
	Number of compressors where source emissions are captured for fuel use or routed to a thermal oxidizer	
	Number of compressors utilizing other emissions control technique (specify emissions control methodology)	
	Emission reductions from voluntary action (mt CH ₄)	

Compressor Starts

Applicable Segments:

- Production

Quantification Methods:

- GHGI segment specific EFs⁵³

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Compressor starts	Actual count of starts	
	Actual count of compressors	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁵⁴	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	

⁵² As calculated per the specified emission quantification methodologies for each source.

⁵³ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-134: 2014 Data and Calculated CH₄ Potential Emissions [Mg] for the Natural Gas Production Stage, by NEMS Region

⁵⁴ Partners reducing the number of compressor starts should use the specified methodology to calculate methane emission reductions achieved. Partners reducing the volume of methane from compressor starts can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.



	Emission reductions from voluntary action (mt CH ₄)	
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Dehydrator Vents

Applicable Segments:

- Production, Gathering & Boosting, and Processing (GHGRP)
- Transmission Compression and Storage (GHGI)

Quantification Methods:

- Subpart W - Calculation Method 1 using computer modeling for glycol dehydrators⁵⁵
- Subpart W - Calculation Method 2 using EFs and population counts for glycol dehydrators⁵⁶
- Subpart W - Calculation Method 3 using engineering calculations for desiccant dehydrators⁵⁷
- GHGI - Segment specific EFs⁵⁸ (for Transmission Compression and Storage segment facilities only)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Dehydrators (GHGRP)	For Calculation Method 1 and Calculation Method 2, actual count of glycol dehydrators	X
	For Calculation Method 3, actual count of desiccant dehydrators	X
	Count of dehydrators venting to a flare or regenerator firebox/fire tubes	X
	Count of dehydrators at the facility that vented to a vapor recovery device	X
	Annual CH ₄ emissions from dehydrators venting to a flare or regenerator firebox/fire tubes (mt CH ₄)	X
	Annual CH ₄ Emissions from all dehydrators that were not vented to a flare or regenerator firebox/fire tubes (mt CH ₄)	X
Dehydrators (GHGI)	Actual count of dehydrators in Transmission Compression and Storage segments	
	Annual CH ₄ emissions from dehydrators in Transmission Compression and Storage segments (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁵⁹	Number of Dehydrators routed to Vapor Recovery Units	
	Number of Dehydrators routed to Flare or Regenerator Firebox/Fire Tubes	
	Number of Dehydrators utilizing other emissions control technique (specify emissions control methodology)	

⁵⁵ 40 CFR Part 98.233(e)(1); 40 CFR Part 98.233(e)(5)

⁵⁶ 40 CFR Part 98.233(e)(2); 40 CFR Part 98.233(e)(5)

⁵⁷ 40 CFR Part 98.233(e)(3); 40 CFR Part 98.233(e)(5)

⁵⁸ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-137: 2014 Data and CH₄ Emissions [Mg] for the Natural Gas Transmission Stage

⁵⁹ As calculated per the specified emission quantification methodologies for each source. For Transmission Compression and Storage segment facilities **only**, partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
	Methodology used to quantify reductions (Transmission Compression and Storage segment facilities only)	
	Emission reductions from voluntary action (mt CH ₄)	

Damages

Applicable Segments:

- Production and Distribution

Quantification Methods:

- GHGI segment specific EFs⁶⁰⁶¹

Reporting:

Emission Source ⁶²	Data Elements Collected via Facility-Level Reporting	GHGRP
Upsets: Mishaps (Dig-Ins)[distribution]	Miles of pipeline	
	Annual CH ₄ Emissions (mt CH ₄)	
Upsets: Mishaps [production]	Actual count of mishaps	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁶³	Actions taken to minimize excavation damages/reduce methane emissions from excavation damages (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Distribution Mains

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Equipment leaks calculated using population counts and EFs⁶⁴
 - Cast Iron Mains EF
 - Plastic Mains EF (for plastic mains and for cast iron or unprotected steel distribution mains with plastic liners or inserts)
 - Protected Steel Mains EF

⁶⁰ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-138: 2014 Data and CH₄ Emissions (Mg) for the Natural Gas Distribution Stage

⁶¹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-134: 2014 Data and Calculated CH₄ Potential Emissions [Mg] for the Natural Gas Production Stage

⁶² Specific GHGI emission source names used

⁶³ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

⁶⁴ 40 CFR 98.233(r)



- Unprotected Steel Mains EF

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Distribution Mains	Total miles of cast iron distribution mains	X
	Annual CH ₄ emissions from cast iron mains (mt CH ₄)	X
	Total miles of plastic distribution mains	X
	Annual CH ₄ emissions from plastic mains (mt CH ₄)	X
	Total miles of protected steel distribution mains	X
	Annual CH ₄ emissions from protected steel mains (mt CH ₄)	X
	Total miles of unprotected steel distribution mains	X
	Annual CH ₄ emissions from unprotected steel mains (mt CH ₄)	X
	Total miles of cast iron or unprotected steel distribution mains with Plastic Liners or Inserts	
	Annual CH ₄ emissions from cast iron or unprotected steel distribution mains with Plastic Liners or Inserts (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁶⁵	Miles of cast iron mains replaced with plastic, protected steel, or rehabilitated with plastic pipe inserts or cured-in-place liners	
	Miles of unprotected steel mains cathodically protected, replaced with protected steel, or rehabilitated with pipe inserts or cured-in-place liners	
	Emission reductions from voluntary action (mt CH ₄)	

Distribution Services

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Calculated using population counts and EFs⁶⁶
 - Cast Iron Services EF
 - Plastic Services EF
 - Protected Steel Services EF
 - Unprotected Steel Services EF

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Distribution Services	Total number of cast iron services	
	Annual CH ₄ emissions from cast iron services (mt CH ₄)	
	Total number of copper services	X

⁶⁵ As calculated per the specified emission quantification methodologies for each source.

⁶⁶ 40 CFR 98.233(r)



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
	Annual CH ₄ emissions from copper services (mt CH ₄)	X
	Total number of plastic services	X
	Annual CH ₄ emissions from plastic services (mt CH ₄)	X
	Total number of protected steel services	X
	Annual CH ₄ emissions from protected steel services (mt CH ₄)	X
	Total number of unprotected steel services	X
	Annual CH ₄ emissions from unprotected steel services (mt CH ₄)	X
	Total number of cast iron or unprotected steel services with plastic liners or inserts	
	Annual CH ₄ emissions from cast iron or unprotected steel services with plastic liners or inserts (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁶⁷	Actual count of cast iron services replaced with plastic, protected steel, copper, or rehabilitated with plastic pipe inserts	
	Actual count of unprotected steel services replaced with cathodically protected or replaced with protected steel, plastic, copper, or rehabilitated with plastic pipe inserts	
	Emission reductions from voluntary action (mt CH ₄)	

Equipment Leaks

Applicable Segments:

- Production, Gathering & Boosting, Processing, Transmission Compression, Storage, LNG Storage, and LNG Import/Export

Quantification Methods:

- Subpart W Methodology for Production and Gathering and Boosting – Population counts and default population emissions factors⁶⁸
- Subpart W Methodology for Processing and Transmission Compression - Leak survey and default leaker EFs for compressor and non-compressor components in gas service
- Subpart W Methodology for Storage - Leak survey and default leaker EFs for storage station components in gas service, and population counts and default population EFs
- Subpart W Methodology for LNG Storage - Leak survey and default leaker EFs for LNG storage components in LNG service, and population counts and default population EFs for vapor recovery compressors in gas service
- Subpart W Methodology for LNG Import/Export - Leak survey and default leaker EFs for LNG terminals components in LNG service, and leak survey and default leaker EFs for LNG terminals components in gas service

Reporting:

⁶⁷ As calculated per the specified emission quantification methodologies for each source.

⁶⁸ Per current rule.



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Equipment Leaks [production] ⁶⁹	Count of each emission source type	X
	Count of each major equipment type	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [gathering & boosting] ⁷⁰	Count of each emission source type	X
	Count of each major equipment type	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [processing]	Number of each surveyed component type identified as leaking	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [transmission compression]	Number of each surveyed component type identified as leaking	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [storage]	Number of each surveyed component type identified as leaking (storage station components in gas service)	X
	Count of each emission source type (storage wellhead components in gas service)	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [LNG storage]	Number of each surveyed component type identified as leaking (LNG storage components in LNG service)	X
	Count of vapor recovery compressors	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [LNG import export]	Number of each surveyed component type identified as leaking (LNG terminals components in LNG service)	X
	Count of vapor recovery compressors	X
	Annual CH ₄ emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁷¹	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Equipment Leaks - Gathering and Transmission Pipelines

Applicable Segments:

- Gathering & Boosting (GHGRP)
- Transmission Pipelines (GHGI)

Quantification Methods:

- Subpart W - Calculated using population counts and EFs⁷²

⁶⁹ EPA intends to revise this section as needed once the Greenhouse Gas Reporting Rule Leak Detection Methodology Revisions Proposal becomes finalized.

⁷⁰ EPA intends to revise this section as needed once the Greenhouse Gas Reporting Rule Leak Detection Methodology Revisions Proposal becomes finalized.

⁷¹ As calculated per the specified emission quantification methodologies for each source.

⁷² 40 CFR 98.233(r)



- GHGI – GHGI segment specific EF⁷³ (for Transmission Pipelines only)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Gathering pipeline equipment leaks (GHGRP)	Total miles of cast iron gathering pipelines	X
	Annual CH ₄ emissions from cast iron gathering pipelines (mt CH ₄)	X
	Total miles of protected steel gathering pipelines	X
	Annual CH ₄ emissions from protected steel gathering pipelines (mt CH ₄)	X
	Total miles of unprotected steel gathering pipelines	X
	Annual CH ₄ emissions from unprotected steel gathering pipelines (mt CH ₄)	X
	Total miles of plastic/composite gathering pipelines	X
	Annual CH ₄ emissions from plastic/composite gathering pipelines (mt CH ₄)	X
Transmission pipeline leaks (GHGI)	Total miles of transmission pipelines	
	Annual CH ₄ emissions from transmission pipelines (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁷⁴	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Equipment Leaks - Above Grade Transmission-Distribution Transfer Stations

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - EF based on equipment leak surveys⁷⁵
- Subpart W - Calculated using population counts and EFs⁷⁶

Reporting:

⁷³ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-137: 2014 Data and CH₄ Emissions (Mg) for the Natural Gas Transmission Stage

⁷⁴ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from transmission pipeline leaks and must specify what that methodology is. For gathering pipeline equipment leaks, reductions are to be calculated per the specified emission quantification methodologies.

⁷⁵ 40 CFR 98.233(q)(8)(ii)

⁷⁶ 40 CFR 98.233(r)(2)(ii)

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Above Grade Transmission-Distribution (T-D) Transfer Stations ⁷⁷	Actual count of above grade T-D transfer stations	X
	Actual count of meter/regulator runs at above grade T-D transfer station facilities	X
	Number of above grade T-D transfer stations surveyed in the calendar year or surveyed in the current leak survey cycle	X
	Number of meter/regulator runs at above grade T-D transfer stations surveyed in the calendar year or surveyed in the current leak survey cycle	X
	Average time that meter/regulator runs surveyed in the calendar year or surveyed in the current leak survey cycle were operational, in hours	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁷⁸	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Equipment Leaks - Below Grade Transmission-Distribution Transfer Stations

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Calculated using population counts and EFs⁷⁹

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Below Grade Transmission-Distribution Transfer Stations ⁸⁰	Actual count of below grade transmission-distribution transfer stations (gas service, inlet pressure > 300 psig)	X
	Actual count of below grade transmission-distribution transfer station (gas service, inlet pressure 100 to 300 psig)	X
	Actual count of below grade transmission-distribution transfer station (gas service, inlet pressure < 100 psig)	X
	Average estimated time that the emission source type was operational in the calendar year (hours)	X

⁷⁷ 40 CFR 98.236(q)(3)

⁷⁸ As calculated per the specified emission quantification methodologies for each source.

⁷⁹ 40 CFR 98.233(r)(6)(i)

⁸⁰ 40 CFR 98.232(i)(2)



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁸¹	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Equipment Leaks - Above Grade Metering-Regulating Stations

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Calculated using population counts and EFs⁸²

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Above Grade Metering-Regulating Stations ⁸³	Actual count of above grade metering-regulating stations that are not T-D transfer stations	X
	Actual count of meter/regulator runs at above grade metering-regulating stations that are not above grade T-D transfer stations	X
	Average estimated time that each meter/regulator run at above grade metering-regulating stations that are not above grade T-D transfer stations was operational in the calendar year (hour)	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁸⁴	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Equipment Leaks - Below Grade Metering-Regulating Stations

Applicable Segments:

⁸¹ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

⁸² 40 CFR 98.233(r)(6)(ii)

⁸³ 40 CFR 98.232(i)(3)

⁸⁴ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.



- Distribution

Quantification Methods:

- Subpart W - Calculated using population counts and EFs⁸⁵

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Below Grade Metering-Regulating Stations ⁸⁶	Actual count of below grade M&R Station, Gas Service, Inlet Pressure > 300 psig	X
	Actual count of below grade M&R Station, Gas Service, Inlet Pressure 100 to 300 psig	X
	Actual count of below grade M&R Station, Gas Service, Inlet Pressure < 100 psig	X
	Average estimated time that the emission source type was operational in the calendar year (hours)	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁸⁷	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Flare Stacks

Applicable Segments:

- Production, Gathering & Boosting, Processing, Transmission Compression, Storage, LNG Storage, and LNG Import/Export.

Quantification Methods:

- Subpart W - Calculation using measured or estimated flow and gas composition, and flare combustion efficiency; accounting for feed gas sent to an un-lit flare as applicable⁸⁸

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Flare Stacks	Actual count of flare stacks	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to	Number of flares with all or part of gas flow routed to VRU, fuel, or	

⁸⁵ 40 CFR 98.233(r)(6)(i)

⁸⁶ 40 CFR 98.232(i)(4)

⁸⁷ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

⁸⁸ 40 CFR 98.233(n)(5); 40 CFR 98.233(n)(6)



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
reduce methane emissions during the reporting year ⁸⁹	other beneficial use	
	Combined volume of gas routed to VRU, fuel, or other beneficial use	
	Emission reductions from voluntary action (mt CH ₄)	

Liquids Unloading

Applicable Segments:

- Production

Quantification Methods:

- Subpart W - Calculation Method 1 using direct measurement for each tubing diameter and pressure group with and without plunger lifts⁹⁰
- Subpart W - Calculation Method 2 using engineering calculations for wells without plunger lifts⁹¹
- Subpart W - Calculation Method 3 using engineering calculations for wells with plunger lifts⁹²

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Liquids unloading for wells	Actual count of wells conducting liquids unloading without plunger lifts that are vented to the atmosphere	X
	Count of unloadings for all wells without plunger lifts	X
	Annual CH ₄ emissions from wells conducting liquids unloading without plunger lifts that are vented to the atmosphere (mt CH ₄)	X
	Actual count of wells conducting liquids unloading with plunger lifts that are vented to the atmosphere	X
	Count of unloadings for all wells with plunger lifts	X
	Annual CH ₄ emissions from wells conducting liquids unloading with plunger lifts that are vented to the atmosphere (mt CH ₄)	X
	Annual CH ₄ Emissions from liquids unloading (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁹³	Number of wells reducing emissions voluntarily	
	Emissions control methodology being implemented (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Meters - Residential

⁸⁹ As calculated per the specified emission quantification methodologies for each source.

⁹⁰ 40 CFR 98.233(f)(1), data elements will be reported separately for wells with plunger lifts and wells without plunger lifts

⁹¹ 40 CFR 98.233(f)(2)

⁹² 40 CFR 98.233(f)(3)

⁹³ As calculated per the specified emission quantification methodologies for each source.



Applicable Segments:

- Distribution

Quantification Methods:

- GHGI segment specific EFs⁹⁴

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Residential meters	Actual count of outdoor residential meters	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁹⁵	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Meters - Commercial/Industrial

Applicable Segments:

- Distribution

Quantification Methods:

- GHGI segment specific EFs⁴

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Commercial/Industrial Meters	Actual count of commercial/industrial meters	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁹⁶	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Natural Gas Pneumatic Device (Controller) Vents

⁹⁴ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-138: 2014 Data and CH₄ Emissions (Mg) for the Natural Gas Distribution Stage

⁹⁵ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

⁹⁶ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.



Applicable Segments:

- Production, Gathering & Boosting, Processing, Transmission Compression, and Storage

Quantification Methods:

- Subpart W - Calculation using actual count of devices and default EFs⁹⁷

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Natural Gas Pneumatic Device (Controller) Vents (all sectors except processing)	Actual count of high-bleed pneumatic controllers ⁹⁸	X
	Annual CH ₄ emissions from high-bleed pneumatic controllers (mt CH ₄)	X
	Actual count of intermittent-bleed pneumatic controllers	X
	Annual CH ₄ emissions from intermittent-bleed pneumatic controllers (mt CH ₄)	X
	Actual count of low-bleed pneumatic controllers ⁹⁹	X
	Annual CH ₄ emissions from low-bleed pneumatic controllers (mt CH ₄)	X
Natural Gas Pneumatic Device (Controller) Vents (processing sector only) ¹⁰⁰	Actual count of high-bleed pneumatic controllers ¹⁰¹	
	Annual CH ₄ emissions from high-bleed pneumatic controllers (mt CH ₄)	
	Actual count of intermittent-bleed pneumatic controllers	
	Annual CH ₄ emissions from intermittent-bleed pneumatic controllers (mt CH ₄)	
	Actual count of low-bleed pneumatic controllers ¹⁰²	
	Annual CH ₄ emissions from low-bleed pneumatic controllers (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹⁰³	Number of high-bleed controllers converted to low-bleed	
	Number of high-bleed controllers converted to zero emitting or removed from service	
	Number of intermittent-bleed pneumatic controllers converted to zero emitting or removed from service	
	Number of low bleed pneumatic controllers converted to zero emitting or removed from service	
	Number of pneumatic controllers utilizing other emissions control technique (specify emissions control methodology)	

⁹⁷ *ibid*

⁹⁸ Natural gas-actuated controllers with a bleed rate greater than 6 scf per hour

⁹⁹ Natural gas-actuated controllers with a bleed rate less than or equal to 6 scf per hour

¹⁰⁰ Processing sector reporters providing voluntary supplementary information should use the Transmission Compression segment EFs to quantify methane emissions (40 CFR 98.232(e)(5)).

¹⁰¹ Natural gas-actuated controllers with a bleed rate greater than 6 scf per hour

¹⁰² Natural gas-actuated controllers with a bleed rate less than or equal to 6 scf per hour

¹⁰³ As calculated per the specified emission quantification methodologies for each source.



	Emission reductions from voluntary action (mt CH ₄)	
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Natural Gas Driven Pneumatic (Chemical Injection) Pump Vents

Applicable Segments:

- Production and Gathering & Boosting

Quantification Methods:

- Subpart W - Calculation using actual count of devices and default EFs¹⁰⁴

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Natural Gas Driven Pneumatic (Chemical Injection) Pump Vents	Actual count of natural gas driven pneumatic pumps	X
	Annual CH ₄ emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ¹⁰⁵	Number of pumps with mitigation actions implemented to reduce emissions	
	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

Pipeline Pigging - Venting

Applicable Segments:

- Production

Quantification Methods:

- GHGI segment specific EFs¹⁰⁶

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Pipeline Pigging releases	Actual count of pigging operations	
	Annual CH ₄ emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹⁰⁷	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	

¹⁰⁴ 40 CFR 98.233(c)

¹⁰⁵ As calculated per the specified emission quantification methodologies for each source.

¹⁰⁶ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-127: 2014 CH₄ Emissions from Petroleum Production Field Operations

¹⁰⁷ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.



	Emission reductions from voluntary action (mt CH ₄)	
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Pressure Relief Valves

Applicable Segments:

- Production and Distribution

Quantification Methods:

- GHGI segment specific EFs^{108,109,110}

Reporting:

Emission Source ¹¹¹	Data Elements Collected via Facility-Level Reporting	GHGRP
Upsets: pressure relief valves	Actual count of PRVs	
	Annual CH ₄ emissions (mt CH ₄)	
Routine maintenance: pressure relief valve releases	Actual count of PRVs (production)	
	Miles of main (distribution)	
	Annual CH ₄ emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹¹²	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Storage Tank Vented Emissions

Applicable Segments:

- Production and Gathering & Boosting

Quantification Methods:

- Fixed-Roof Tanks:
 - Subpart W - Calculation Method 1 using computer modeling for gas-liquid separators or gathering and boosting non-separator equipment¹¹³,
 - Subpart W - Calculation Method 2 using engineering calculations for gas-liquid separators or gathering and boosting non-separator equipment or wells flowing directly to atmospheric

¹⁰⁸ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-134: 2014 Data and Calculated CH₄ Potential Emissions [Mg] for the Natural Gas Production Stage

¹⁰⁹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-127: 2014 CH₄ Emissions from Petroleum Production Field Operations

¹¹⁰ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-138: 2014 Data and CH₄ Emissions (Mg) for the Natural Gas Distribution Stage

¹¹¹ Specific GHGI emission source names used

¹¹² Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

¹¹³ 40 CFR 98.233(j)(1)



- storage tanks¹¹⁴, or
- Subpart W - Calculation Method 3 using an emission factor and population counts for hydrocarbon liquids flowing to gas-liquid separators, non-separator equipment, or directly to atmospheric storage¹¹⁵
- Floating Roof Tanks: GHGI segment specific EFs¹¹⁶

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Storage Tank Vents Using Calculation Methods 1 and 2	Total volume of oil sent to tanks from all gas-liquid separators or gathering and boosting non-separator equipment or wells flowing directly to atmospheric tanks with oil throughput ≥10 barrels/day (bbl/day)	X
	Number of wells sending oil to gas-liquid separators or gathering and boosting non-separator equipment or wells flowing directly to atmospheric tanks with oil throughput ≥10 bbl/day	X
	Count of tanks that control emissions with vapor recovery systems	X
	Annual CH ₄ emissions from tanks with vapor recovery systems (mt CH ₄)	X
	Count of tanks that vented directly to the atmosphere	X
	Annual CH ₄ emissions from venting (mt CH ₄)	X
	Actual count of atmospheric tanks	X
	Count of tanks with flaring emission control measures	X
	Annual CH ₄ Emissions (mt CH ₄)	X
	Annual CH ₄ emissions from flaring (mt CH ₄)	X
	Count of gas-liquid separators whose liquid dump valves did not close properly	X
	Annual CH ₄ emissions from improperly functioning dump valves (mt CH ₄)	X
Storage Tank Vents Using Calculation Method 3	Total volume of oil sent to tanks from all wellhead separators and direct from wells with oil throughput <10 barrels/day (bbl/day)	X
	Count of tanks that did not control emissions with flares	X
	Annual CH ₄ emissions from tanks without flares (mt CH ₄ emissions)	X
	Count of wells with gas-liquid separators	X
	Count of wells without gas-liquid separators	X
	Count of tanks that vented directly to the atmosphere	X
	Annual CH ₄ emissions from venting (mt CH ₄)	X

¹¹⁴ 40 CFR 98.233(j)(2)

¹¹⁵ 40 CFR 98.233(j)(3)

¹¹⁶ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-127: 2014 CH₄ Emissions from Petroleum Production Field Operations



	Actual count of atmospheric tanks	X
	Count of tanks with flaring emission control measures	X
	Annual CH ₄ Emissions (mt CH ₄)	X
	Annual CH ₄ emissions from flaring (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ¹¹⁷	Number of tanks routed to VRU or beneficial use	
	Number of tanks routed to flare	
	Emission reductions from voluntary action (mt CH ₄)	

Storage Tank Vents - Transmission

Applicable Segments:

- Transmission Compression

Quantification Methods:

- Subpart W - Calculation using measured flow data for leakage due to scrubber dump valve malfunction, gas composition, and estimated leakage duration; accounting for flare control as applicable¹¹⁸
- Alternate calculation method using actual tank counts multiplied by an EF calculated from company-specific transmission storage tank vent data reported to Subpart W (for Transmission Compression segment facilities not reporting to Subpart W **only**)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Transmission storage tank vents	Count of storage tank vent stacks with flares attached	X
	Count of storage tank vent stacks without flares attached	X
	Count of storage tank vent stacks with dump valve leakage direct to atmosphere	X
	Annual CH ₄ emissions from storage tank vent stacks with dump valve leakage venting gas directly to the atmosphere (mt CH ₄)	X
	Count of storage tank vent stacks with flared dump valve leakage	X
	Actual count of storage tanks utilizing the alternate calculation method	
	Annual CH ₄ emissions using the alternate calculation method (mt CH ₄)	
	Annual CH ₄ emissions from storage tank vent stacks with flared dump valve leakage (mt CH ₄)	X
Voluntary action to	Number of tanks with compressor scrubber dump valve	

¹¹⁷ As calculated per the specified emission quantification methodologies for each source.

¹¹⁸ 40 CFR 98.233(k)



reduce methane emissions during the reporting year ¹¹⁹	leakage routed to flare or control device	
	Emission reductions from voluntary action (mt CH ₄)	

Station Venting

Applicable Segments:

- Storage and LNG Storage

Quantification Methods:

- GHGI segment specific EFs¹²⁰

Reporting:

Emission Source ¹²¹	Data Elements Collected via Facility-Level Reporting	GHGRP
Routine Maintenance/Upsets: Storage Station - Venting	Actual count of storage stations (natural gas)	
	Annual CH ₄ emissions (mt CH ₄)	
LNG Storage: LNG Stations	Actual count of LNG storage stations (natural gas)	
	Annual CH ₄ emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹²²	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Well Drilling

Applicable Segments:

- Production

Quantification Methods:

- GHGI segment specific EFs¹²³

Reporting:

¹¹⁹ As calculated per the specified emission quantification methodologies for each source.

¹²⁰ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-137: 2014 Data and CH₄ Emissions [Mg] for the Natural Gas Transmission Stage

¹²¹ Specific GHGI emission source names used

¹²² Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

¹²³ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014, Table A-127: 2014 CH₄ Emissions from Petroleum Production Field Operations



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Well drilling	Actual count of wells drilled	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹²⁴	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

Well Venting During Well Completions/Workovers With Hydraulic Fracturing

Applicable Segments:

- Production

Quantification Methods:

- Subpart W - Calculation using combined production rate measurement and engineering calculations in Equation W-10A¹²⁵
- Subpart W - Calculation using measured vented or flared volume from each well in Equation W-10B¹²⁶

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Well venting during well completions with hydraulic fracturing ¹²⁷	Actual count of completions in the calendar year	X
	Actual count of wells that conduct flaring	X
	Actual count of wells that have reduced emission completions	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Well venting during well workovers with hydraulic fracturing ¹²⁸	Total count of workovers	X
	Actual count of wells that conduct flaring	X
	Actual count of wells that have reduced emission workovers	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ¹²⁹	Number of well completions/workovers utilizing flaring	
	Number of well completions/workovers utilizing reduced emission completions	
	Number of well completions/workovers utilizing other emissions control technique (specify emissions control	

¹²⁴ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

¹²⁵ 40 CFR 98.233(g)

¹²⁶ 40 CFR 98.233(g)

¹²⁷ For oil wells, this section is limited to oil wells that have a gas-oil ratio (GOR) of 300 scf/STB or greater.

¹²⁸ For oil wells, this section is limited to oil wells that have a gas-oil ratio (GOR) of 300 scf/STB or greater.

¹²⁹ As calculated per the specified emission quantification methodologies for each source.



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
	methodology)	
	Emission reductions from voluntary action (mt CH ₄)	

Gas Well Venting During Well Completions/Workovers Without Hydraulic Fracturing

Applicable Segments:

- Production

Quantification Methods:

- Subpart W, for workovers - Calculation using a count of workovers and an EF¹³⁰
- Subpart W, for completions - Calculation using measured production rate¹³¹

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Gas well venting during well completions without hydraulic fracturing	Total count of completions that vented directly to atmosphere without flaring	X
	Total count of completions with flaring	X
	Annual CH ₄ Emissions that resulted from venting gas directly to the atmosphere for completions (mt CH ₄)	X
	Annual CH ₄ Emissions that resulted from flares for completions	X
Gas well venting during well workovers without hydraulic fracturing	Total count of workovers that vented directly to atmosphere without flaring	X
	Total count of workovers with flaring	X
	Annual CH ₄ Emissions that resulted from venting gas directly to the atmosphere for workovers (mt CH ₄)	X
	Annual CH ₄ Emissions that resulted from flares for workovers	X
Voluntary action to reduce methane emissions during the reporting year ¹³²	Number of workovers utilizing flaring	
	Number of workovers utilizing other emissions control technique (specify emissions control methodology)	
	Emission reductions from voluntary action (mt CH ₄)	

Well Testing Venting & Flaring

Applicable Segments:

- Production

¹³⁰ 40 CFR 98.233(h)

¹³¹ *ibid*

¹³² As calculated per the specified emission quantification methodologies for each source.



Quantification Methods:

- Subpart W, for oil wells - Calculation using GOR, average annual flow rate, and testing duration in Equation W-17A¹³³
- Subpart W, for gas wells - Calculation using average annual flow rate and testing duration in Equation W-17B¹³⁴

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Well Testing Venting & Flaring	Actual count of wells tested in a calendar year that vented emissions to the atmosphere	X
	Average number of days wells were tested that vented emissions to the atmosphere	X
	Actual count of wells tested in a calendar year that flared emissions	X
	Average number of days wells were tested that flared emissions	X
	Annual CH ₄ Emissions from venting (mt CH ₄)	X
	Annual CH ₄ Emissions from flaring (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ¹³⁵	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

¹³³ 40 CFR 98.233(l)

¹³⁴ *ibid*

¹³⁵ As calculated per the specified emission quantification methodologies for each source.



Appendix A: Segment and Facility Definitions

Onshore Petroleum and Natural Gas Production

For purposes of the Methane Challenge Program, onshore petroleum and natural gas production means all equipment on a single well-pad or associated with a single well-pad (including but not limited to compressors, generators, dehydrators, storage vessels, engines, boilers, heaters, flares, separation and processing equipment, and portable non-self-propelled equipment, which includes well drilling and completion equipment, workover equipment, and leased, rented or contracted equipment) used in the production, extraction, recovery, lifting, stabilization, separation or treating of petroleum and/or natural gas (including condensate). This equipment also includes associated storage or measurement vessels, all petroleum and natural gas production equipment located on islands, artificial islands, or structures connected by a causeway to land, an island, or an artificial island. Onshore petroleum and natural gas production also means all equipment on or associated with a single enhanced oil recovery (EOR) well pad using CO₂ or natural gas injection.

A production facility means all natural gas equipment on a single well-pad or associated with a single well-pad and CO₂ EOR operations that are under common ownership or common control including leased, rented, or contracted activities by an onshore natural gas production owner or operator and that are located in a single hydrocarbon basin as defined in 40 CFR 98.238. Where a person or entity owns or operates more than one well in a basin, then all onshore natural gas production equipment associated with all wells that the person or entity owns or operates in the basin would be considered one facility.

Onshore Petroleum and Natural Gas Gathering and Boosting

For purposes of the Methane Challenge Program, onshore petroleum and natural gas gathering and boosting means gathering pipelines and other equipment used to collect petroleum and/or natural gas from onshore production gas or oil wells and used to compress, dehydrate, sweeten, or transport the petroleum and/or natural gas to a natural gas processing facility, a natural gas transmission pipeline, or a natural gas distribution pipeline. Gathering and boosting equipment includes, but is not limited to, gathering pipelines, separators, compressors, acid gas removal units, dehydrators, pneumatic devices/pumps, storage vessels, engines, boilers, heaters, and flares. Gathering and boosting equipment does not include equipment reported under any other industry segment defined in subpart W. Gathering pipelines operating on a vacuum and gathering pipelines with a gas to oil ratio (GOR) less than 300 standard cubic feet per stock tank barrel (scf/STB) are not included in this industry segment (oil here refers to hydrocarbon liquids of all API gravities).

A gathering and boosting facility for purposes of reporting under Methane Challenge means all gathering pipelines and other equipment located along those pipelines that are under common ownership or common control by a gathering and boosting system owner or operator and that are located in a single hydrocarbon basin as defined in 40 CFR 98.238. Where a person owns or operates more than one gathering and boosting system in a basin (for example, separate gathering lines that are not connected), then all gathering and boosting equipment that the person owns or operates in the basin would be considered one facility. Any gathering and boosting equipment that is associated with a single gathering and boosting system, including leased, rented, or contracted activities, is considered to be under common control of the owner or operator of the gathering and boosting system that contains the pipeline. The facility does not include equipment and pipelines that are part of any other industry



segment defined in subpart W.

Onshore Natural Gas Processing

For purposes of the Methane Challenge Program, natural gas processing means the separation of natural gas liquids (NGLs) or non-methane gases from produced natural gas, or the separation of NGLs into one or more component mixtures. Separation includes one or more of the following: forced extraction of natural gas liquids, sulfur and carbon dioxide removal, fractionation of NGLs, or the capture of CO₂ separated from natural gas streams. This segment also includes all residue gas compression equipment owned or operated by the natural gas processing plant. This industry segment includes processing plants that fractionate gas liquids, and processing plants that do not fractionate gas liquids but have an annual average throughput of 25 MMscf per day or greater.

A natural gas processing facility for the purposes of reporting under the Methane Challenge is any physical property, plant, building, structure, source, or stationary equipment in the natural gas processing industry segment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas. Operators of military installations may classify such installations as more than a single facility based on distinct and independent functional groupings within contiguous military properties.

Onshore Natural Gas Transmission Compression & Underground Natural Gas Storage

For purposes of the Methane Challenge Program, onshore natural gas transmission compression means any stationary combination of compressors that move natural gas from production fields, natural gas processing plants, or other transmission compressors through transmission pipelines to natural gas distribution pipelines, LNG storage facilities, or into underground storage. A transmission compressor station includes equipment for liquids separation, and tanks for the storage of water and hydrocarbon liquids. Residue (sales) gas compression that is part of onshore natural gas processing plants are included in the onshore natural gas processing segment and are excluded from this segment.

Underground natural gas storage means subsurface storage, including depleted gas or oil reservoirs and salt dome caverns that store natural gas that has been transferred from its original location for the primary purpose of load balancing (the process of equalizing the receipt and delivery of natural gas); natural gas underground storage processes and operations (including compression, dehydration and flow measurement, and excluding transmission pipelines); and all the wellheads connected to the compression units located at the facility that inject and recover natural gas into and from the underground reservoirs

A natural gas transmission compression facility or underground natural gas storage facility for the purposes of reporting under the Methane Challenge is any physical property, plant, building, structure, source, or stationary equipment in the natural gas transmission compression industry segment or underground natural gas storage industry segment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas. Operators of military installations may classify such installations as more than a single facility based on distinct and independent functional groupings within contiguous military properties.



Alternate Facility Definition, Transmission Pipeline Company:

For facilities covered under the ONE Future Emissions Intensity Commitment Option that do not report to Subpart W (only), a natural gas transmission compression facility or underground natural gas storage facility for the purposes of reporting under the Methane Challenge consists of an aggregation at the “Transmission Pipeline Company” level of the facilities described in the previous paragraph. See Onshore Natural Gas Transmission Pipeline definition below.

Liquefied Natural Gas (LNG) Storage

For purposes of the Methane Challenge Program, LNG storage means onshore LNG storage vessels located above ground, equipment for liquefying natural gas, compressors to capture and re-liquefy boil-off-gas, re-condensers, and vaporization units for re-gasification of the liquefied natural gas.

A LNG storage facility for the purposes of reporting under the Methane Challenge is any physical property, plant, building, structure, source, or stationary equipment in the LNG storage industry segment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas.

LNG Import and Export Equipment

For purposes of the Methane Challenge Program, LNG import equipment means all onshore or offshore equipment that receives imported LNG via ocean transport, stores LNG, re-gasifies LNG, and delivers re-gasified natural gas to a natural gas transmission or distribution system. LNG export equipment means all onshore or offshore equipment that receives natural gas, liquefies natural gas, stores LNG, and transfers the LNG via ocean transportation to any location, including locations in the United States.

A LNG import and export facility for the purposes of reporting under the Methane Challenge is any physical property, plant, building, structure, source, or stationary equipment in the LNG import and export equipment industry segment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas.

Onshore Natural Gas Transmission Pipeline

For purposes of the Methane Challenge Program, onshore natural gas transmission pipeline means all natural gas pipelines that are a Federal Energy Regulatory Commission rate-regulated Interstate pipeline, a state rate-regulated Intrastate pipeline, or a pipeline that falls under the “Hinshaw Exemption” as referenced in section 1(c) of the Natural Gas Act, 15 I.S.C. 717-717(w)(1994).

An onshore natural gas transmission pipeline facility for the purpose of reporting under the Methane Challenge is the total U.S. mileage of natural gas transmission pipelines owned or operated by an onshore natural gas transmission pipeline owner or operator. If an owner or operator has multiple pipelines in the United States, the facility is considered the aggregate of those pipelines, even if they are not interconnected.



Natural Gas Distribution

For purposes of the Methane Challenge Program, natural gas distribution means the distribution pipelines and metering and regulating equipment at metering-regulating stations that are operated by a Local Distribution Company (LDC) within a single state that is regulated as a separate operating company by a public utility commission or that is operated as an independent municipally-owned distribution system. This segment also excludes customer meters and regulators, infrastructure, and pipelines (both interstate and intrastate) delivering natural gas directly to major industrial users and farm taps upstream of the local distribution company inlet.

A natural gas distribution facility for the purposes of reporting under the Methane Challenge is the collection of all distribution pipelines and metering-regulating stations that are operated by an LDC within a single state that is regulated as a separate operating company by a public utility commission or that are operated as an independent municipally-owned distribution system.