



Methane Challenge Program

ONE Future Commitment Option Technical Document

DRAFT



Contents

- Document Version.....4**
- Introduction.....5**
- Methane Challenge Program Reporting.....5**
- Emission Sources.....6**
 - Acid Gas Removal Vents..... 8
 - Associated Gas Venting & Flaring..... 9
 - Blowdowns – Production..... 10
 - Blowdowns – Transmission Pipeline (Between Compressor Stations)..... 11
 - Blowdowns – Distribution Pipeline..... 12
 - Blowdown Vent Stacks..... 13
 - Combustion Units..... 14
 - Combustion Units – Subpart C..... 15
 - Compressors – Centrifugal (Production and Gathering & Boosting)..... 16
 - Compressors – Centrifugal (Other Segments)..... 17
 - Compressors – Reciprocating (Production and Gathering and Boosting)..... 19
 - Compressors – Reciprocating (Other Segments)..... 20
 - Compressor Starts..... 22
 - Damages..... 23
 - Dehydrator Vents..... 24
 - Distribution Mains..... 26
 - Distribution Services..... 27
 - Equipment Leaks..... 28
 - Equipment Leaks – Gathering and Transmission Pipelines..... 30
 - Equipment Leaks – Above Grade Transmission-Distribution Transfer Stations 31**
 - Equipment Leaks – Below Grade Transmission-Distribution Transfer Stations..... 32
 - Equipment Leaks – Above Grade Metering-Regulating Stations..... 33
 - Equipment Leaks – Below Grade Metering-Regulating Stations..... 34
 - Flare Stacks..... 35
 - Liquids Unloading..... 36
 - Meters – Residential..... 37
 - Meters – Commercial/Industrial..... 37



Natural Gas Pneumatic Device (Controller) Vents..... 38

Natural Gas Driven Pneumatic (Chemical Injection) Pump Vents..... 40

Pressure Relief Valves..... 41

Station Venting..... 42

Storage Tank Vented Emissions..... 43

Storage Tank Vents – Transmission Compression..... 45

Well Drilling..... 46

Well Venting During Well Completions/Workovers with Hydraulic Fracturing..... 47

Gas Well Venting During Well Completions/Workovers without Hydraulic Fracturing..... 48

Well Testing Venting & Flaring..... 49

Renewable Natural Gas..... 50

Innovative Technologies, Practices, and Approaches..... 54

Appendix A: GHGI Emission Factors Referenced in this Technical Document..... 55

Appendix B: Segment and Facility Definitions..... 57

Onshore Petroleum and Natural Gas Production..... 57

Onshore Petroleum and Natural Gas Gathering and Boosting..... 57

Onshore Natural Gas Processing..... 58

Onshore Natural Gas Transmission Compression & Underground Natural Gas Storage..... 58

Liquefied Natural Gas (LNG) Storage..... 59

LNG Import and Export Equipment..... 59

Onshore Natural Gas Transmission Pipeline..... 59

Natural Gas Distribution..... 59



Document Version

This version of the Technical Document was developed for the Methane Challenge program's "Information Collection Request" renewal in 2021. It includes the following updates from the previously published version (updates are noted with yellow highlighting):

- Clarifies the calculation methodologies and their Subpart W citations for Above Grade Transmission-Distribution (T-D) Transfer Stations (page 31);
- Adds new data elements for Renewable Natural Gas (pages 50 - 53) as developed through the program's Continuous Improvement Process; and
- Adds a mechanism for companies to report information on innovative technologies, practices, and approaches to measure, track, and/or mitigate their emissions (page 54)
-



Introduction

This document provides additional details to augment the Methane Challenge Program (“Methane Challenge”) ONE Future Emissions Intensity (ONE Future) Commitment Framework and Partnership Agreement documents.¹ This document provides information on how companies selecting the ONE Future Commitment Option 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

To provide context for participation in the Program and facilitate annual tracking of progress, EPA collects the following information from partner companies during facility registration and management in the Methane Challenge reporting module of the electronic Greenhouse Gas Reporting Tool (e-GGRT):

- List of included facilities that report to Subpart W (facility ID)
- List of included facilities not reporting to Subpart W (Methane Challenge facility ID²)
- List of facilities acquired/divested during the reporting year.

In the following sections of this document, for each emission source, a corresponding method or methods to quantify methane emissions is described. For each source, a “Reporting” table also summarizes the data elements the Methane Challenge Program utilizes 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.
- **Data Elements Collected via Facility-Level Reporting:** This column lists all data elements to be reported by Partners and indicates those already collected through GHGRP Subpart W reporting. For facilities that report to Subpart W, the applicable Subpart W data for the reporting year will be automatically pre-populated in their Methane Challenge reporting forms by the reporting system.³ These facilities will only need to fill out the supplementary Methane Challenge data elements. Facilities that do not report to Subpart W will fill out all relevant data elements on their Methane Challenge reporting forms.

Annual reports also provide partners an opportunity to report optional, qualitative information to give context for their progress each year.

For reporting purposes, the Methane Challenge Program uses the same emission source definitions as Subpart W and the GHGI (where applicable), and the segment and facility definitions from Subpart W⁴.

¹ The Methane Challenge Program ONE Future Emissions Intensity Commitment Framework can be found on the Natural Gas STAR Methane Challenge website at <https://www.epa.gov/natural-gas-star-program/methane-challenge-program-one-future-emissions-intensity-commitment>.

² In the Methane Challenge module in e-GGRT, the system will auto-generate IDs for all non-GHGRP facilities created by the partner’s Implementation Manager (IM) or the IM’s Delegates.

³ This creates a copy of the Subpart W data in the Methane Challenge reporting module. Methane Challenge reports cannot edit/update data reported to the GHGRP.

⁴ 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.



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 B for alternate facility definition for “Transmission Pipeline Company”)⁵. For sources using GHGI emission factors, these data are provided for reporters’ reference in Appendix A to this document.

Data will be reported at the facility level, except where specified. Annually, EPA collects company-specific information about activity data, methane emissions, and voluntary emission reductions as submitted by ONE Future Commitment Option partners and publicly releases all non-confidential data submitted either to the Methane Challenge Program⁶ 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. Partners may provide their company-specific methane emission intensity rate to Methane Challenge for publication on their partner profile page. 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/>.⁷

Emission Sources

On the following pages, quantification methods and data elements to be collected via facility-level reporting are detailed for each emission source.

For each source we identify its “Applicable Segments.” For the purposes of this document:

- “Production” refers to the Onshore Petroleum and Natural Gas Production segment, [as defined in Appendix B](#).
- “Gathering and Boosting” refers to the Onshore Petroleum and Natural Gas Gathering and Boosting segment, [as defined in Appendix B](#).
- “Processing” refers to the Onshore Natural Gas Processing segment, [as defined in Appendix B](#).
- “Transmission Compression” refers to the Onshore Natural Gas Transmission Compression segment, [as defined in Appendix B](#).
- “Storage” refers to the Underground Natural Gas Storage segment, [as defined in Appendix B](#).
- “LNG Storage” refers to the Liquefied Natural Gas (LNG) Storage segment, [as defined in Appendix B](#).
- “LNG Import/Export” refers to the LNG Import and Export Equipment segment, [as defined in Appendix B](#).
- “Transmission Pipelines” refers to the Onshore Natural Gas Transmission Pipeline segment, [as defined in Appendix B](#).
- “Distribution” refers to the Natural Gas Distribution segment, [as defined in Appendix B](#).

⁵ 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.

⁶ All Methane Challenge supplemental data must be non-confidential.

⁷ The scope of this protocol is limited to CH₄ emissions intensity computation and progress tracking.



Emission Sources



Acid Gas Removal Vents

Applicable Segments:

- Processing

Quantification Methods:

- GHGI segment specific EF for the relevant year⁸

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Acid Gas Removal (AGR) vents (GHGI)	Actual count of AGR units	X
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁹	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

⁸ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

⁹ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is. The reporting form includes two fields: methodology “type” which includes the choices Measurement data; Engineering calculations; Modeling; Emission factor; Other (specify) and the free text “methodology details” field for additional information about the methodology used.



Emission Sources



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 applicable¹⁰

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Associated Gas Venting & Flaring (GHGRP)	Volume of oil produced during venting/flaring (bbls)	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 ¹¹	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

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

¹¹ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Blowdowns – Production

Applicable Segments:

- Production

Quantification Methods:

- GHGI segment specific EF for the relevant year¹²

Emission Source ¹³	Data Elements Collected via Facility-Level Reporting	GHGRP
Vessel Blowdowns (GHGI)	Actual count of blowdowns (<i>optional</i>)	
	Actual count of vessels	
	Annual CH ₄ Emissions (mt CH ₄)	
Compressor Blowdowns (GHGI)	Actual count of blowdowns (<i>optional</i>)	
	Actual count of compressors	
	Annual CH ₄ emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹⁴	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

¹² Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annexes 3.5 (Table 3.5-3) and 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_petroleum_systems_annex_tables.xlsx and https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx and.

¹³ Specific GHGI emission source names used

¹⁴ 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.



Emission Sources



Blowdowns – Transmission Pipeline (Between Compressor Stations)

Applicable Segments:

- Transmission Pipelines

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 pipeline¹⁵
- Subpart W - Calculation method using direct measurement of emissions using a flow meter¹⁶
- Alternate calculation method using actual event counts multiplied by the average emission factor as calculated from all company-specific Subpart W facility events (for Transmission Pipeline facilities not reporting to Subpart W **only**)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Transmission Pipeline Blowdowns (between Compressor Stations) (GHGRP)	Actual count of blowdowns	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Transmission Pipeline Blowdowns (between Compressor Stations) (alternate calculation method)	Actual count of blowdowns	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹⁷	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 (specify emissions control methodology) ¹⁸	
	Emission reductions from voluntary action (mt CH ₄)	

¹⁵ 98.233(i)(2)

¹⁶ 98.233(i)(3)

¹⁷ As calculated per the specified emission quantification methodologies for each source.

¹⁸ An example of another emissions control technique is the installation of mechanical or composite sleeves that avoided the need to blowdown gas.



Emission Sources



Blowdowns – Distribution Pipeline

Applicable Segments:

- Distribution

Quantification Methods:

- GHGI segment specific EF for the relevant year¹⁹

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Routine maintenance: Pipeline Blowdowns (GHGI)	Miles of distribution pipeline mains	
	Miles of distribution pipeline services ²⁰	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ²¹	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)	

¹⁹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

²⁰ Partners should use the average service length reported annually to PHMSA to convert services counts to services mileage. If an average service length is not available, Partners should use PHMSA's default length of 90 feet/service.

²¹ 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).



Emission Sources



Blowdown Vent Stacks

Applicable Segments:

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

Quantification Methods:

- Subpart W - Calculation method using engineering calculation method by equipment or event type²²
- Subpart W - Calculation method using direct measurement of emissions using a flow meter²³
- 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 Gathering & Boosting, Processing, Transmission Compression, and LNG Import/Export segment facilities not reporting to Subpart W **only**)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Blowdown Vent Stacks (GHGRP)	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
Blowdown Vent Stacks (alternate calculation method)	Annual total CH ₄ emissions calculated using the alternate calculation method (mt CH ₄)	
Blowdown Vent Stacks (summary)	Annual CH ₄ Emissions (mt CH ₄) <i>[this value will be auto-calculated in the reporting form as a sum of the above emissions fields]</i>	—
Voluntary action to reduce methane emissions during the reporting year ²⁴	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

²² 98.233(i)(2)

²³ 98.233(i)(3)

²⁴ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Combustion Units

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 composition²⁵

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Small combustion units - external and internal (GHGRP)	Actual count of external fuel combustion units with a rated heat capacity less than or equal to 5 mmBtu/hr PLUS internal fuel combustion units that are not compressor-drivers, with a rated heat capacity less than or equal to 1 mmBtu/hr	X
Large combustion units - internal (GHGRP)	Actual count of internal fuel combustion units that are not compressor-drivers, with a rated heat capacity greater than 1 million Btu per hour	X
	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
Large combustion units - external (GHGRP)	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 ²⁶	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

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

²⁶ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Combustion Units – Subpart C

Applicable Segments:

- Processing, Transmission Compression, Storage, LNG Storage, 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 EF²⁷
- Alternate calculation method using total volume of fuel consumed and the fuel-specific emission factors for methane (for facilities not reporting to Subpart C **only**)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Individual combustion units (98.36(b))	Total number of combustion units	X
	Annual CH ₄ Emissions (mt CH ₄) from all individual combustion units	X
Aggregation of combustion units (98.36(c)(1))	Total number of aggregated groups	X
	Total annual CH ₄ Emissions (mt CH ₄) from aggregated 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 common pipe configurations	X
	Total annual CH ₄ Emissions (mt CH ₄) for all units served by a common fuel supply line	X
Combustion units (alternate calculation method)	Total volume of fuel consumed, by fuel type (natural gas (scf), distillate fuel oil no. 2 (diesel) (gallon), motor gasoline (gallon), and propane gas (scf))	
	Total annual CH ₄ Emissions calculated using the alternate calculation method (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ²⁸	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

²⁷ 40 CFR 98.33(c)

²⁸ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Compressors – Centrifugal (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 vents²⁹
- GHGI - Segment specific EF for the relevant year³⁰ (for dry seal centrifugal compressors **only**)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Centrifugal compressors with wet seal oil degassing vents (GHGRP)	Number of centrifugal compressors with wet seal oil degassing vents	X
	Annual CH ₄ emissions (mt CH ₄)	X
Centrifugal compressors with dry seals (GHGI)	Number of centrifugal compressors with dry seals	
	Annual CH ₄ emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ³¹	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)	

²⁹ 40 CFR 98.233(o)(10)

³⁰ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annexes 3.5 (Table 3.5-3) and 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_petroleum_systems_annex_tables.xlsx and https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

³¹ 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.



Emission Sources



Compressors – Centrifugal (Other Segments)

Applicable Segments:

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

Quantification Methods:

- Subpart W - Individual compressor source “as found” measurements³²
 - Operating mode: blowdown valve leakage
 - Operating mode: wet seal oil degassing vent
 - Not-operating-depressurized mode: isolation valve leakage
- Subpart W - Reporter-specific EF for mode-source combinations not measured in the reporting year³³
- Subpart W - Continuous monitoring³⁴
- Subpart W - Manifolder “as found” measurements³⁵
- Centrifugal Compressors with dry seals (Transmission Compression segment); partners may use **either**:
 - GHGI – Segment specific EF for the relevant year³⁶
 - Average company EF based on measurements from dry seals; measurements are to be taken using Subpart W measurement methods for wet seals
- Alternate calculation method using average company EF based on all company-specific Subpart W centrifugal compressor measurements (for Processing, Transmission Compression, Storage, LNG Storage, and LNG Import/Export facilities not reporting to Subpart W **only**)³⁷

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Centrifugal compressors (GHGRP)	Number of centrifugal compressors with wet seals	X
	Number of manifolded groups of compressors with wet seals, isolation valves, or blowdown valves	X
	Number of compressors with wet seals, isolation valves, or blowdown valves that are routed to a flare	X
	Number of compressors with wet seals, isolation valves, or blowdown valves that have vapor recovery	X
	Number of compressors with wet seals, isolation valves, or blowdown valves that are routed to combustion (fuel or thermal oxidizer)	X
	Annual CH ₄ emissions vented to the atmosphere (mt CH ₄)	X
Centrifugal compressors (GHGI)	Number of centrifugal compressors with dry seals	X
	Annual CH ₄ emissions from dry seals (mt CH ₄)	
Centrifugal compressors	Number of compressors not reported to Subpart W (i.e., those utilizing the alternate calculation method)	

³² 40 CFR 98.233(o)(1)(i)

³³ 40 CFR 98.233(o)(6)

³⁴ 40 CFR 98.233(o)(1)(ii)

³⁵ 40 CFR 98.233(o)(1)(iii)

³⁶ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

³⁷ Facilities that do not report to Subpart W may also report detailed activity data if available; if detailed activity data are reported, emissions will still be calculated and reported using the alternate calculation method.



Emission Sources



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
(alternate calculation method)	Annual CH ₄ emissions using the alternate calculation method (mt CH ₄)	
Centrifugal compressors (summary)	Annual CH ₄ Emissions (mt CH ₄) <i>[this value will be auto-calculated in the reporting form]</i>	
Voluntary action to reduce methane emissions during the reporting year	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) ³⁸	

³⁸ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Compressors – Reciprocating (Production and Gathering and Boosting)

Applicable Segments:

- Production and Gathering & Boosting

Quantification Methods:

- Subpart W - Calculation using default population EF for reciprocating compressors³⁹

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Reciprocating compressors (GHGRP)	Number of reciprocating compressors	X
	Annual CH ₄ emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year	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)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄) ⁴⁰	

³⁹ 40 CFR 98.233(p)(10)

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.



Emission Sources



Compressors – Reciprocating (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
 - Standby-pressurized mode: blowdown valve leakage
 - Not-operating-depressurized mode: isolation valve leakage
- Subpart W - Reporter-specific EF for mode-source combinations not measured in the reporting year⁴²
- Subpart W - Continuous monitoring⁴³
- Subpart W - Manifolder “as found” measurements⁴⁴
- Alternate calculation method using average company EF based on all company-specific Subpart W reciprocating compressor measurements (for Processing, Transmission Compression, Storage, LNG Storage, and LNG Import/Export facilities not reporting to Subpart W **only**)⁴⁵

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 (fuel or thermal oxidizer), or vapor recovery	X
	Number of compressors routing blowdown valve leakage to flares, combustion (fuel or thermal oxidizer), or vapor recovery	X
	Number of compressors routing rod packing vents to flares, combustion (fuel or thermal oxidizer), or vapor recovery	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
Reciprocating compressors (alternate calculation method)	Actual count of compressors not reported to Subpart W (i.e., those utilizing the alternate calculation method)	
	Annual CH ₄ emissions using the alternate calculation method (mt CH ₄)	
Reciprocating	Annual CH ₄ emissions (mt CH ₄)	

⁴¹ 40 CFR 98.233(p)(1)(i)

⁴² 40 CFR 98.233(p)(6)

⁴³ 40 CFR 98.233(p)(1)(ii)

⁴⁴ 40 CFR 98.233(p)(1)(iii)

⁴⁵ Facilities that do not report to Subpart W may also report detailed activity data if available; if detailed activity data are reported, emissions will still be calculated and reported using the alternate calculation method.



Emission Sources



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
compressors (summary)	<i>[this value will be auto-calculated in the reporting form]</i>	
Voluntary action to reduce methane emissions during the reporting year	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)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄) ⁴⁶	

⁴⁶ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Compressor Starts

Applicable Segments:

- Production

Quantification Methods:

- GHGI segment specific EF for the relevant year⁴⁷

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Compressor starts (GHGI)	Actual count of starts (<i>optional</i>)	
	Actual count of compressors	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁴⁸	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

⁴⁷ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annexes 3.5 (Table 3.5-3) and 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_petroleum_systems_annex_tables.xlsx and https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

⁴⁸ 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 Sources



Damages

Applicable Segments:

- Gathering & Boosting and Distribution

Quantification Methods:

- GHGI segment specific EF for the relevant year⁴⁹

Reporting:

Emission Source ⁵⁰	Data Elements Collected via Facility-Level Reporting	GHGRP
Gathering & Boosting Upsets: Mishaps (GHGI)	Miles of gathering pipeline	
	Annual CH ₄ Emissions (mt CH ₄)	
Distribution Upsets: Mishaps (GHGI)	Miles of distribution pipeline mains	
	Miles of distribution pipeline services ⁵¹	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁵²	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)	

⁴⁹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

⁵⁰ Specific GHGI emission source names used

⁵¹ Partners should use the average service length reported annually to PHMSA to convert services counts to services mileage. If an average service length is not available, Partners should use PHMSA's default length of 90 feet/service.

⁵² 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 Sources



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 dehydrators⁵³
- Subpart W - Calculation Method 2 using EFs and population counts for glycol dehydrators⁵⁴
- Subpart W - Calculation Method 3 using engineering calculations for desiccant dehydrators⁵⁵
- For Subpart W elements, data will be reported by type where noted (i.e., small, large, and desiccant)
- GHGI - Segment specific EF for the relevant year⁵⁶ (for Transmission Compression and Storage segment facilities **only**)
- Alternate calculation method using Subpart W Calculation Method 1 for Transmission Compression and Storage facilities that elect to use computer modeling

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Dehydrators (GHGRP; alternate calculation method)	For Calculation Method 1 and Calculation Method 2, actual count of glycol dehydrators (by type: small, large)	X
	For Calculation Method 3, actual count of desiccant dehydrators	X
	Count of dehydrators venting to a flare or regenerator firebox/fire tubes (by type: small, large, and desiccant)	X
	Count of dehydrators at the facility that vented to a vapor recovery device (by type: small, large, and desiccant)	X
	Annual CH ₄ emissions from dehydrators venting to a flare or regenerator firebox/fire tubes (mt CH ₄) (by type: small, large, and desiccant)	X
	Annual CH ₄ Emissions from all dehydrators that were not vented to a flare or regenerator firebox/fire tubes (mt CH ₄) (by type: small, large, and desiccant)	X
Dehydrators (GHGI)	Volume of gas dehydrated (MMscf/yr) 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 ⁵⁷	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	

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

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

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

⁵⁶ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx

⁵⁷ 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 Sources



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



Emission Sources



Distribution Mains

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Equipment leaks calculated using population counts and EFs^{58,59}
 - 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
 - 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 ⁶⁰	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 plastic or protected steel, or rehabilitated with pipe inserts or cured-in-place liners	
	Emission reductions from voluntary action (mt CH ₄)	

⁵⁸ 40 CFR 98.233(r)

⁵⁹ Based on comments received on the Continuous Improvement proposal published August 13, 2018, the Methane Challenge Program will continue to use the Subpart W emission factors (40 CFR 98.233(r) and Table W-7) for the Distribution Mains source for the 2017 reporting year. EPA will continue to evaluate the Methane Challenge reporting methodology for this source for future reporting years.

⁶⁰ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Distribution Services

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Calculated using population counts and EFs^{61,62}
 - Copper Services EF
 - Plastic Services EF
 - Protected Steel Services EF
 - Unprotected Steel Services EF
- Cast Iron Services - Unprotected Steel Services EF is used as a proxy quantification method for this source
- Cast Iron or Unprotected Steel Services with Plastic Liners or Inserts – plastic services EF

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Distribution Services	Total number of copper services	X
	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 services	
	Annual CH ₄ emissions from cast iron services (mt CH ₄)	
	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 ⁶³	Actual count of cast iron services replaced with plastic, protected steel, copper, or rehabilitated with plastic pipe inserts
Actual count of unprotected steel services cathodically protected or replaced with protected steel, plastic, copper, or rehabilitated with plastic pipe inserts		
Emission reductions from voluntary action (mt CH ₄)		

⁶¹ 40 CFR 98.233(r)

⁶² Based on comments received on the Continuous Improvement proposal published August 13, 2018, the Methane Challenge Program will continue to use the Subpart W emission factors (40 CFR 98.233(r) and Table W-7) for the Distribution Services source for the 2017 reporting year. EPA will continue to evaluate the Methane Challenge reporting methodology for this source for future reporting years.

⁶³ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



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 – Leak survey and default leaker EFs for components in gas service, and population counts and default population EFs⁶⁴
- 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 storage wellhead 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 gas 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
- Alternate calculation method using average company EF based on all company-specific Subpart W leak surveys (for Processing, Transmission Compression, Storage, LNG Storage, and LNG Import/Export facilities not reporting to Subpart W only)

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGR P ⁶⁵
Equipment Leaks [production] (GHGRP)	Number of each surveyed component type identified as leaking	X
	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] (GHGRP)	Number of each surveyed component type identified as leaking	X
	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] (GHGRP)	Number of each surveyed component type identified as leaking	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [transmission compression] (GHGRP)	Number of each surveyed component type identified as leaking	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [storage] (GHGRP)	Number of each surveyed component type identified as leaking (storage station components in gas service;	X

⁶⁴ Per Greenhouse Gas Reporting Rule Leak Detection Methodology Revisions.

⁶⁵ The reporting form will also allow for the reporting of voluntary leak survey data that are not reported under Subpart W.



Emission Sources



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
	storage wellhead components in gas service)	
	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] (GHGRP)	Number of each surveyed component type identified as leaking (LNG storage components in LNG service; LNG storage components in gas service)	X
	Count of vapor recovery compressors	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks [LNG import export] (GHGRP)	Number of each surveyed component type identified as leaking (LNG terminals components in LNG service; LNG terminals components in gas service)	X
	Count of vapor recovery compressors	X
	Annual CH ₄ emissions (mt CH ₄)	X
Equipment Leaks (alternate calculation method)	Actual count of facilities (processing, transmission compression, storage, LNG Storage or LNG import/export) not reported to Subpart W (i.e., those utilizing the alternate calculation method)	
	Annual CH ₄ emissions using the alternate calculation method (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁶⁶	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

⁶⁶ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Equipment Leaks – Gathering and Transmission Pipelines

Applicable Segments:

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

Quantification Methods:

- Subpart W – Calculated using population counts and EFs⁶⁷
- GHGI – Segment specific EF for the relevant year⁶⁸ (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	X
	Annual CH ₄ emissions from transmission pipelines (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁶⁹	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

⁶⁷ 40 CFR 98.233(r)

⁶⁸ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

⁶⁹ 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.



Emission Sources



Equipment Leaks – Above Grade Transmission-Distribution Transfer Stations

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Leak survey and default leaker EFs for facilities conducting surveys on an annual basis⁷⁰
- Subpart W - Population counts and EFs for facilities conducting surveys over multiple years⁷¹

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Above Grade Transmission-Distribution (T-D) Transfer Stations ⁷² (GHGRP)	Does the facility perform equipment leak surveys across a multiple year leak survey cycle	X
	Actual count of above grade T-D transfer stations	X
	Actual count of meter/regulator runs at above grade T-D transfer station facilities	
	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 ⁷³	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

⁷⁰ 40 CFR 98.233(q)(2)(x)

⁷¹ 40 CFR 98.233(q)(2)(xi)

⁷² 40 CFR 98.236(q)(2), 40 CFR 98.236(q)(3)

⁷³ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Equipment Leaks – Below Grade Transmission-Distribution Transfer Stations

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Calculated using population counts and EFs⁷⁴

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Below Grade Transmission-Distribution Transfer Stations ⁷⁵ (GHGRP)	Actual count of below grade transmission-distribution transfer stations (gas service, inlet pressure > 300 psig)	X
	Actual count of below grade transmission-distribution transfer stations (gas service, inlet pressure 100 to 300 psig)	X
	Actual count of below grade transmission-distribution transfer stations (gas service, inlet pressure < 100 psig)	X
	Average estimated time that the emission source type was operational in the calendar year (hours) (by inlet pressure category)	X
	Annual CH ₄ Emissions (mt CH ₄) (by inlet pressure category)	X
Voluntary action to reduce methane emissions during the reporting year ⁷⁶	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

⁷⁴ 40 CFR 98.233(r)(6)(i)

⁷⁵ 40 CFR 98.232(i)(2)

⁷⁶ 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 Sources



Equipment Leaks – Above Grade Metering-Regulating Stations

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Calculated using population counts and EFs⁷⁷

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Above Grade Metering-Regulating Stations ⁷⁸ (GHGRP)	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 ⁷⁹	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

⁷⁷ 40 CFR 98.233(r)(6)(ii)

⁷⁸ 40 CFR 98.232(i)(3)

⁷⁹ 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 Sources



Equipment Leaks – Below Grade Metering-Regulating Stations

Applicable Segments:

- Distribution

Quantification Methods:

- Subpart W - Calculated using population counts and EFs⁸⁰

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Below Grade Metering-Regulating Stations ⁸¹ (GHGRP)	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) (by inlet pressure category)	X
	Annual CH ₄ Emissions (mt CH ₄) (by inlet pressure category)	X
Voluntary action to reduce methane emissions during the reporting year ⁸²	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

⁸⁰ 40 CFR 98.233(r)(6)(i)

⁸¹ 40 CFR 98.232(i)(4)

⁸² 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 Sources



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 applicable⁸³

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Flare Stacks (GHGRP)	Actual count of flare stacks	X
	Annual CH ₄ Emissions (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ⁸⁴	Number of flares with all or part of gas flow routed to VRU, fuel, or other beneficial use	
	Combined volume of gas routed to VRU, fuel, or other beneficial use	
	Emission reductions from voluntary action (mt CH ₄)	

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

⁸⁴ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



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 lifts⁸⁵
- Subpart W - Calculation Method 2 using engineering calculations for wells without plunger lifts⁸⁶
- Subpart W - Calculation Method 3 using engineering calculations for wells with plunger lifts⁸⁷

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Liquids unloading for wells (GHGRP)	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
Liquids unloading for wells (summary)	Annual CH ₄ Emissions from liquids unloading (mt CH ₄) <i>[this value will be auto-calculated in the reporting form]</i>	
Voluntary action to reduce methane emissions during the reporting year ⁸⁸	Number of wells reducing emissions voluntarily	
	Emissions control methodology being implemented (list)	
	Emission reductions from voluntary action (mt CH ₄)	

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

⁸⁶ 40 CFR 98.233(f)(2)

⁸⁷ 40 CFR 98.233(f)(3)

⁸⁸ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Meters – Residential

Applicable Segments:

- Distribution

Quantification Methods:

- GHGI – Segment specific EF for the relevant year⁸⁹

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Residential meters (GHGI)	Actual count of outdoor residential meters	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁹⁰	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 EF for the relevant year⁹⁰

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Commercial/Industrial Meters (GHGI)	Actual count of commercial/industrial meters	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁹¹	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

⁸⁹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

⁹⁰ Partners can use a methodology of their choosing to calculate voluntary methane emission reductions from this source and must specify what that methodology is.

⁹¹ *Ibid.*



Emission Sources



Natural Gas Pneumatic Device (Controller) Vents

Applicable Segments:

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

Quantification Methods:

- Subpart W - Calculation using count of devices and default EFs⁹² (Production, Gathering & Boosting, Transmission Compression, and Storage). For the first two years of reporting, companies may provide estimated counts. For GHGRP facilities, data pulled in from Subpart W will include estimated counts in the first two years, if reported. Non-GHGRP facilities may also report estimated counts during their first two years of reporting.
- Modified quantification approach (Processing segment **only**) - Processing segment reporters with natural gas operated pneumatic devices should use the Transmission Compression segment EFs from Subpart W to quantify methane emissions.⁹³

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Natural Gas Pneumatic Device (Controller) Vents (GHGRP; all segments except Processing)	Count of high-bleed pneumatic controllers ⁹⁴	X
	Annual CH ₄ emissions from high-bleed pneumatic controllers (mt CH ₄)	X
	Count of intermittent-bleed pneumatic controllers	X
	Annual CH ₄ emissions from intermittent-bleed pneumatic controllers (mt CH ₄)	X
	Count of low-bleed pneumatic controllers ⁹⁵	X
	Annual CH ₄ emissions from low-bleed pneumatic controllers (mt CH ₄)	X
Natural Gas Pneumatic Device (Controller) Vents (Modified approach; Processing segment only)	Count of high-bleed pneumatic controllers ⁹³	
	Annual CH ₄ emissions from high-bleed pneumatic controllers (mt CH ₄)	
	Count of intermittent-bleed pneumatic controllers	
	Annual CH ₄ emissions from intermittent-bleed pneumatic controllers (mt CH ₄)	
	Count of low-bleed pneumatic controllers ⁹⁴	
	Annual CH ₄ emissions from low-bleed pneumatic controllers (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ⁹⁶	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	

⁹² 40 CFR 98.233(a)

⁹³ *Ibid.*

⁹⁴ Natural gas-actuated controllers with a bleed rate greater than 6 scf per hour.

⁹⁵ Natural gas-actuated controllers with a bleed rate less than or equal to 6 scf per hour.

⁹⁶ As calculated per the specified emission quantification methodologies for each source.



Emission Sources





Emission Sources



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 EFs ⁹⁷

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Natural Gas Driven Pneumatic (Chemical Injection) Pump Vents (GHGRP)	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 ⁹⁸	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)	

⁹⁷ 40 CFR 98.233(c)

⁹⁸ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Pressure Relief Valves

Applicable Segments:

- Production and Distribution

Quantification Methods:

- GHGI – Segment specific EF for the relevant year⁹⁹

Reporting:

Emission Source ¹⁰⁰	Data Elements Collected via Facility-Level Reporting	GHGRP
Upsets: pressure relief valves (PRVs) (Production) (GHGI)	Actual count of PRVs	
	Annual CH ₄ emissions (mt CH ₄)	
Routine maintenance: pressure relief valve releases (Distribution) (GHGI)	Miles of main	
	Annual CH ₄ emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹⁰¹	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

⁹⁹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annexes 3.5 (Table 3.5-3) and 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_petroleum_systems_annex_tables.xlsx and https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

¹⁰⁰ Specific GHGI emission source names used

¹⁰¹ 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 Sources



Station Venting

Applicable Segments:

- Storage and LNG Storage

Quantification Methods:

- GHGI – Segment specific EF for the relevant year¹⁰²
- Alternate Calculation Method – In the Storage segment, companies may optionally report blowdown events consistent with Subpart W instead of using the GHGI method, when data are available

Reporting:

Emission Source ¹⁰³	Data Elements Collected via Facility-Level Reporting	GHGRP
Routine Maintenance/Upsets: Storage Station – Venting (GHGI)	Actual count of storage stations (natural gas)	
	Annual CH ₄ emissions (mt CH ₄)	
LNG Storage: LNG Stations (GHGI)	Actual count of LNG storage stations (natural gas)	
	Annual CH ₄ emissions (mt CH ₄)	
Station Venting (Storage; alternate calculation method)	Actual count of blowdowns by equipment or event type	
	Annual CH ₄ emissions by equipment or event type (mt CH ₄) (emissions calculated by equipment or event type)	
	Annual total CH ₄ emissions calculated by flow meter (mt CH ₄) (emissions calculated using flow meters)	
Voluntary action to reduce methane emissions during the reporting year ¹⁰⁴	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

¹⁰² Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

¹⁰³ Specific GHGI emission source names used

¹⁰⁴ 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 Sources



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 equipment¹⁰⁵,
 - 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 storage tanks¹⁰⁶, 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 storage¹⁰⁷
- Floating Roof Tanks:
 - GHGI - Segment specific EF for the relevant year¹⁰⁸

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Fixed-Roof Tanks [Using Calculation Methods 1 and 2] (GHGRP)	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/year)	X
	Number of wells sending oil to gas-liquid separators or wells flowing directly to atmospheric tanks at ≥ 10 bbl/day	X
	Actual count of atmospheric tanks	X
	Annual CH ₄ Emissions (mt CH ₄)	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
	Count of tanks with flaring emission control measures	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

¹⁰⁵ 40 CFR 98.233(j)(1)

¹⁰⁶ 40 CFR 98.233(j)(2)

¹⁰⁷ 40 CFR 98.233(j)(3)

¹⁰⁸ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annexes 3.5 (Table 3.5-3), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_petroleum_systems_annex_tables.xlsx



Emission Sources



Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Fixed-Roof Tanks [Using Calculation Method 3] (GHGRP)	Total annual oil/condensate throughput that is sent to all atmospheric tanks from wells, separators, and non-separator equipment with oil throughput <10 barrels/day (bbl/year)	X
	Count of wells with gas-liquid separators	X
	Count of wells without gas-liquid separators	X
	Actual count of atmospheric tanks	X
	Annual CH ₄ Emissions (mt CH ₄)	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 tanks that vented directly to the atmosphere	
	Annual CH ₄ emissions from venting (mt CH ₄)	
	Count of tanks with flaring emission control measures	X
	Annual CH ₄ emissions from flaring (mt CH ₄)	X
Floating Roof Tanks (GHGI)	Count of floating roof tanks	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹⁰⁹	Number of tanks routed to VRU or beneficial use	
	Number of tanks routed to flare	
	Emission reductions from voluntary action (mt CH ₄)	

¹⁰⁹ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Storage Tank Vents – Transmission Compression

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 applicable¹¹⁰
- 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 (GHGRP)	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
	Annual CH ₄ emissions from storage tank vent stacks with flared dump valve leakage (mt CH ₄)	X
Alternate calculation method	Actual count of storage tanks utilizing the alternate calculation method	
	Annual CH ₄ emissions using the alternate calculation method (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹¹¹	Number of tanks with compressor scrubber dump valve leakage routed to flare or control device	
	Emission reductions from voluntary action (mt CH ₄)	

¹¹⁰ 40 CFR 98.233(k)

¹¹¹ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Well Drilling

Applicable Segments:

- Production

Quantification Methods:

- GHGI – Segment specific EF for relevant year¹¹²

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Well drilling (GHGI)	Actual count of wells drilled	
	Annual CH ₄ Emissions (mt CH ₄)	
Voluntary action to reduce methane emissions during the reporting year ¹¹³	Mitigation actions implemented to reduce methane emissions (list)	
	Methodology used to quantify reductions	
	Emission reductions from voluntary action (mt CH ₄)	

¹¹² Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annexes 3.5 (Table 3.5-3) and 3.6 (Table 3.6-2), https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_petroleum_systems_annex_tables.xlsx and https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx.

¹¹³ 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 Sources



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-10A¹¹⁴
- Subpart W - Calculation using measured vented or flared volume from each well in Equation W-10B¹¹⁵

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Well venting during well completions with hydraulic fracturing ¹¹⁶ (GHGRP)	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 ¹¹⁷ (GHGRP)	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 ¹¹⁸	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 methodology)	
	Emission reductions from voluntary action (mt CH ₄)	

¹¹⁴ 40 CFR 98.233(g)

¹¹⁵ *Ibid.*

¹¹⁶ For oil wells, this section is limited to oil wells that have a gas-oil ratio (GOR) of 300 scf/STB or greater.

¹¹⁷ *Ibid.*

¹¹⁸ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Gas Well Venting During Well Completions/Workovers without Hydraulic Fracturing

Applicable Segments:

- Production

Quantification Methods:

- Subpart W, for completions - Calculation using measured production rate¹¹⁹
- Subpart W, for workovers - Calculation using a count of workovers and an EF¹²⁰

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Gas well venting during well completions without hydraulic fracturing (GHGRP)	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 (mt CH ₄)	X
Gas well venting during well workovers without hydraulic fracturing (GHGRP)	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 (mt CH ₄)	X
Voluntary action to reduce methane emissions during the reporting year ¹²¹	Number of completions or workovers utilizing flaring	
	Number of completions or workovers utilizing other emissions control technique (specify emissions control methodology)	
	Emission reductions from voluntary action (mt CH ₄)	

¹¹⁹ 40 CFR 98.233(h)

¹²⁰ *Ibid.*

¹²¹ As calculated per the specified emission quantification methodologies for each source.



Emission Sources



Well Testing Venting & Flaring

Applicable Segments:

- Production

Quantification Methods:

- Subpart W, for oil wells - Calculation using GOR, average annual flow rate, and testing duration in Equation W-17A¹²²
- Subpart W, for gas wells - Calculation using average annual flow rate and testing duration in Equation W-17B¹²³

Reporting:

Emission Source	Data Elements Collected via Facility-Level Reporting	GHGRP
Well Testing Venting & Flaring (GHGRP)	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 ¹²⁴	Mitigation actions implemented to reduce methane emissions (list)	
	Emission reductions from voluntary action (mt CH ₄)	

¹²² 40 CFR 98.233(l)

¹²³ *Ibid.*

¹²⁴ As calculated per the specified emission quantification methodologies for each source.



Renewable Natural Gas

Applicable Segments:

- Transmission Pipeline, Distribution

Source Description: These data elements address the supply of renewable natural gas (RNG) through natural gas transmission and distribution systems. For the purposes of Methane Challenge RNG reporting, “biogas” is gas produced by the anaerobic digestion of organic matter at one or more of the following sources: municipal solid waste (MSW) landfills, anaerobic digestion (AD) at municipal water resource recovery facilities (WRRFs), AD at livestock farms and AD at stand-alone organic waste management operations. For the purposes of Methane Challenge RNG reporting, “renewable natural gas”¹²⁵ encompasses biogas that has been upgraded for use in place of fossil natural gas. In the reporting form for this commitment, partners will also have the opportunity to provide general information about their companies’ strategies for supplying other “low carbon” fuels.

Raw biogas typically has a methane content between 45 and 65 percent, depending on the source of the feedstock, and must go through a series of steps to be converted into RNG. The treatments used will depend on the source of the raw biogas and the constituents found in the raw biogas. These may include removing moisture, carbon dioxide (CO₂) and trace level contaminants (which, depending on the biogas source, can include siloxanes, volatile organic compounds-- VOCs, and hydrogen sulfide), as well as reducing the nitrogen and oxygen content. Once upgraded, the gas has a methane content of 90 percent or greater.

As a substitute for natural gas, RNG has many end-uses, including in thermal applications, to generate electricity, for vehicle fuel, or as a bio-product feedstock. For the purpose of this commitment option, the end-use is a requested, but not required, data element. To develop a greater understanding of the RNG market and the role of natural gas transmission and distribution systems in advancing use of RNG, the end use is a valuable piece of information. However, EPA recognizes that transmission and distribution companies may not be privy to the information about the end use of the RNG projects for RNG in their systems.

RNG can be used locally at the site where the gas is produced and upgraded, or it can be injected into natural gas transmission or distribution pipelines. This data set is focused on natural gas injected into transmission or distribution pipelines. This data set does not encompass RNG attributes that are purchased, unless the RNG is directly injected into the Partner’s system or another system that is physically connected to the Partner’s system. Additional information on renewable natural gas can be found in a discussion paper published by EPA’s voluntary methane programs in 2020:

<https://www.epa.gov/lmop/overview-renewable-natural-gas-biogas>

If reporting on RNG to Methane Challenge, ONE Future Partners Commit To:

- Annually report RNG data elements to the Program;
- Research the nature and extent of RNG in its system (i.e., information about the biogas project that generated the gas and how the gas is being used by end users) so that the Partner can report as complete a representation of the RNG it has acquired, transported, and delivered as possible by the end of its commitment.

¹²⁵ There are many different definitions of renewable natural gas currently used; these definitions are specifically tailored to each context. For example, the American Gas Association has developed this consensus definition: “Renewable natural gas (RNG) is any pipeline compatible gaseous fuel derived from biogenic or other renewable sources that has lower lifecycle CO₂e emissions than geological natural gas”. Further information on AGA’s definition can be found at this URL: <https://www.aga.org/natural-gas/renewable/>



Emission Sources



Facility-level Annual Reporting:

Data will be reported at the facility-level through e-GGRT as for other ONE Future data. The RNG reporting form tab will allow Partners to report the requested data elements for each biogas project (if more than one). Partners can also use multiple lines per category to indicate multiple interconnects, designated end uses, etc. Data should only be reported on RNG that is received directly from an interconnect with a biogas project or a virtual pipeline or that is received from another system that is physically connected to the Partner’s system and that is then delivered and/or supplied to customers by the partner.

All data elements for RNG are *OPTIONAL and to be provided if feasible*. If data are considered confidential (e.g., by the biogas project developer) and the partner cannot report them, the partner should not report these data and can indicate that the requested data are confidential and cannot be shared in the applicable free-text field. It is not expected that all partners will report all data elements and companies that cannot report all requested data will not be penalized.

Data Category	Data Elements Collected via Facility-Level Reporting
General Information	What role(s) does your company play in the RNG process? (please check all that apply) [Investing in biogas projects; Directly interconnecting with biogas project; Delivering RNG to end users; Supplying RNG to end users; Purchasing environmental attributes for RNG that is physically connected to the company’s system; Purchasing environmental attributes for RNG that is not physically connected to the company’s system]
	For Distribution Partners ¹²⁶ – <ul style="list-style-type: none"> • Does your company offer a ‘green gas’ option to residential customers? • Is your company in the process of offering a ‘green gas’ option?
	Any additional information on the role(s) your company plays in the RNG process, or about ‘green gas’ offerings?
Information about the biogas source	Biogas Project ID ¹²⁷
	What is the feedstock for the biogas? (Anaerobic digester – livestock farm; Anaerobic digester – co-digestion; Anaerobic digester – food production facility; Anaerobic digester – organic waste management; Anaerobic digester – wastewater treatment plan; Landfill; Other (Specify) ¹²⁸)
	Name the specific municipal solid waste landfill or digester (i.e., at water resource recovery facilities (wastewater treatment plants), livestock farms, food production facilities or organic waste management operations) from which the RNG was generated
	What upgrading technology was used? [to be selected from a list]
	Any additional information on the biogas project/upgrading process you wish to share?
Information about the pipeline interconnect(s)	Type of interconnect [Direct interconnect with biogas project; Interconnect with natural gas transmission company <i>delivering/transporting</i> RNG; Interconnect with natural gas distribution company <i>delivering/transporting</i> RNG; Interconnect with natural gas distribution company <i>delivering and supplying</i> RNG]
	If interconnect with natural gas transmission company or distribution company, name of interconnecting company

¹²⁶ If your company operates in multiple states and is in different phases of offering ‘green gas’ to customers in the different states, you can provide additional details in the ‘additional information’ free text field.

¹²⁷ This ID is to be generated by the reporting partner and can be of any alphanumeric format desired. The same ID should be used for any given project across the different tables on the reporting form.

¹²⁸ If project feedstock is a combined waste stream, please select “Other” and specify the waste streams using the nomenclature from the drop-down list



Emission Sources



Data Category	Data Elements Collected via Facility-Level Reporting
	<p>If interconnect with biogas project:</p> <ul style="list-style-type: none"> • Biogas Project ID¹²⁹ • Location of the interconnect (<i>latitude/longitude</i>) • Volume of gas received this year (<i>scf gas</i>) • Reference to the company's gas quality standards that are applicable to this project (e.g., pipeline tariff) • How far is the interconnect from the feedstock source (km)? • Is there a virtual pipeline? <ul style="list-style-type: none"> o If yes, details about the virtual pipeline <p>Any additional information on the interconnect process you wish to share?</p>
Information about the end use(s) and environmental attributes	<p>Biogas Project ID [<i>if known</i>]¹³⁰</p> <p>What is the destined market for the RNG (region/city/state/facility) [<i>if known</i>]?</p> <p>What is the designated end use [<i>if known</i>]? (Thermal applications; Electricity generation; Vehicle fuel; Bio-product feedstock; Interconnect with other natural gas company (specify company); Not designated; Other (specify end use); Unknown)</p> <p>Volume of RNG going to this end use, this year (<i>scf gas</i>) [<i>if known</i>]</p> <p>Any additional information on the end use you wish to share?</p> <p>Does your company currently own the environmental attributes for the RNG? [Yes; No; Unknown]</p> <p>If your company does not own the environmental attributes now, who does? [<i>if known</i>]</p> <p>If, your company does, or at one point did, own the attributes for RNG, does your supply contract for "renewable" natural gas include conveyance of environmental attributes to your company (e.g., by way of a contract clause, attestation)? [Yes; No; Unknown]</p> <p>If your company is selling "renewable" natural gas supply to another downstream entity (e.g., distributor, end consumer etc.), have you contractually conveyed the RNG environmental attributes to the downstream buyer? [Yes; No; Unknown]</p> <p>Is your company using a third party provider to certify or track attributes? If so, which one(s)?</p> <p>Any additional information about environmental attributes that you wish to share?</p>
Information about the Company's strategy for supply of "low carbon fuels"	<p>Company-specific goals or strategies for supply of "low carbon fuels" (such as upgraded biogas, hydrogen, etc.) (e.g., percent of natural gas supply to be RNG by a certain year; convert vehicle fleet to run on natural gas and use RNG for fuel), <i>if applicable</i>.</p> <p>Is your company blending hydrogen into its natural gas supply? [Yes; Planning to; Researching; No; Unknown]</p> <p>If yes, or planning to:</p>

¹²⁹ This ID is to be generated by the reporting partner and can be of any alphanumeric format desired. The same ID should be used for any given project across the different tables on the reporting form.

¹³⁰ This ID is to be generated by the reporting partner and can be of any alphanumeric format desired. The same ID should be used for any given project across the different tables on the reporting form.



Emission Sources



Data Category	Data Elements Collected via Facility-Level Reporting
	<ul style="list-style-type: none">• At what rate will you be blending (% hydrogen by volume)
	<ul style="list-style-type: none">• What is the source and/or feedstock of the hydrogen? (e.g., renewable/nuclear/etc.)
	<ul style="list-style-type: none">• Is any upgrading/cleaning of the hydrogen required before injection?
	<ul style="list-style-type: none">• What pipeline types does your company inject hydrogen into (material and pressure)?
	<ul style="list-style-type: none">• Have you done any related customer engagement?
	<ul style="list-style-type: none">• Has anything been done to customer appliances (if yes, what)?



Innovative Technologies, Practices, and Approaches

Applicable Segments: All

The Methane Challenge program encourages partners to share information on innovative technologies, practices, and approaches they are using to measure, track, and/or mitigate their emissions that are not covered by the other BMP data elements. Partners may provide information on technologies/practices/approaches to mitigate emissions from existing emission sources in the program, or for emission sources not currently included in the program.

Under this Innovation Reporting mechanism, partners can share this information by providing the following details:

- Applicable emission source(s)
- Applicable industry segments
- Name of technology/practice(s) to mitigate emissions from that source
- Scope of implementation
- Confirmation the technology/practice is covered by regulation (federal, state, local)
- For each technology/practice
 - A description of the technology/practice(s)
 - Description of how widely available technology is
 - Description of any technical infeasibilities/issues that need to be addressed
 - Estimated range of emission reductions achievable and methodology used to develop the estimate
 - Assessment of cost-effectiveness
 - Data elements needed to monitor progress in reducing methane emissions
- Any other information needed to fully understand the technology/practice/approach

Methane Challenge will publish these data and may use them to inform future commitment options and its library of technical information.

Before reporting under this mechanism, Partners should email the program managers at gasstar@epa.gov to get approval for each topic they wish to submit data on. On approval, Partners will receive instructions how to submit this information.



Appendix A: GHGI Emission Factors Referenced in this Technical Document

Emission factors are rounded to the nearest tenth kg/unit activity.

Emission Source	Applicable Segment	Average CH ₄ Emission Factor	
		Petroleum Systems; Reporting Year 2017 ^{131,132}	Natural Gas Systems; Reporting Year 2017 ¹³³
Acid Gas Removal (AGR) vents	Processing	NA	42,762.9 kg/AGR
Blowdowns – Vessel Blowdowns	Production	1.5 kg/vessel	1.6 kg/vessel
Blowdowns – Compressor Blowdowns	Production	72.7 kg/compressor	77.4 kg/compressor
Blowdowns – Distribution Pipeline	Distribution	NA	1.965 kg/mile
Compressors – Centrifugal; Dry Seals	Production	NA	29,791.1 kg/compressor ¹³⁴
Compressors – Centrifugal; Dry Seals	Gathering & Boosting	NA	29,791.1 kg/compressor ¹³⁵
Compressors – Centrifugal; Dry Seals	Transmission		44,000 kg/compressor
Compressor Starts	Production	162.6 kg/compressor	173.1 kg/compressor
Dehydrator vents (Transmission)	Transmission Compression	NA	1.8 kg/MMscf
Dehydrator vents (Storage)	Storage	NA	2.3 kg/MMscf
Damages (Upsets: Mishaps)	Gathering & Boosting	NA	13.7 kg/mile
Damages (Upsets: Mishaps (Dig-ins))	Distribution	NA	30.6 kg/mile
Equipment Leaks	Transmission Pipelines	NA	10.9 kg/mile
Meters – Residential	Distribution	NA	1.5 kg/outdoor meter
Meters – Commercial/Industry	Distribution	NA	9.7 kg/meter
Pressure Relief Valves – Upsets	Production	0.7 kg/valve	0.7 kg/PRV
Pressure Relief Valves – Routine Maintenance	Distribution	NA	0.963 kg/mile

Floating Roof Tanks — Production 6,515.8 kg/tank NA

¹³¹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.5 (Table 3.5-3), value for 2016, https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_petroleum_systems_annex_tables.xlsx

¹³² Where it is not possible to distinguish between Petroleum and Natural Gas systems for these sources, reporters are to use the factors for Natural Gas Systems; allocation between the systems is the purview of ONE Future.

¹³³ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3.6 (Table 3.6-2), value for 2016, https://www.epa.gov/sites/production/files/2018-04/2018_ghgi_natural_gas_systems_annex_tables.xlsx

¹³⁴ GHGI Processing segment factor for dry seals. There are no GHGI / GHGRP emission factors for this source; reporters are to use the GHGI Processing factor.

¹³⁵ *Ibid.*





Appendix B: 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.

An 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.

An 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.