Natural Gas STAR
Methane Challenge Program:
Supplementary Technical Information

Contents

Introduction

This document provides additional details to augment the Natural Gas STAR Methane Challenge Program ("Methane Challenge") proposal dated July 23, 2015.[1] The July proposal listed methane emission sources that EPA is considering for inclusion in the Best Management Practices Commitment Option (BMP Option), which are included for reference in Appendix A.[2] This document provides additional information for each of these sources, including source descriptions, additional detail on mitigation options, and proposed Greenhouse Gas Reporting Program (GHGRP) and voluntary reporting data elements that would be reported annually to EPA to track partner progress.

While this document focuses on the sources that were included in the proposed BMP Option, the technical details and reporting elements associated with these emission sources would be consistent between the BMP and ONE Future Emissions Intensity Commitment Options. Similar information will be released to cover additional sources that will be tracked by partners for the ONE Future Option.

EPA requests feedback on the information presented in this document. Specific questions are presented in Appendix B.

Methane Challenge Commitment Options and Program Reporting

As described in the July Methane Challenge Program proposal, under the BMP Option, companies would commit to company-wide implementation of best practices to reduce methane emissions from key sources by a future date, as determined by the partner company. The ONE Future Option entails making a commitment to achieve a specified average rate of emissions intensity across all facilities within a specific segment by 2025. EPA's intent through Methane Challenge is to promote voluntary methane emission reduction actions for operations not subject to emission control regulations, and to spur actions beyond those regulatory requirements (e.g., State regulations and New Source Performance Standards (NSPS)). Partner companies would designate the timing for achieving company-wide implementation of related voluntary mitigation actions for one or more of the key emission sources (BMP Option) or would specify milestones for achieving their target emissions rate (ONE Future Option).

Transparency is a key principle of the Methane Challenge Program proposal. To achieve this transparency, Methane Challenge partner companies would report annually on their actions supporting this voluntary Program through an EPA platform. EPA aims to minimize the reporting burden to allow partner companies to focus time and resources on implementation of methane-reducing activities. Because relevant oil and gas data are already collected by Subpart W[3] of the GHGRP for many industry operations, EPA intends to rely on that data to the extent possible.

For facilities required to report to the GHGRP, Subpart W already collects most of the information that would be relevant to tracking Methane Challenge Program commitments at the company level. Supplementary voluntarily-supplied data would also be collected under the Methane Challenge Program

[1] The Methane Challenge Program proposal can be found on the Natural Gas STAR website at http://www3.epa.gov/gasstar/documents/methane_challenge_proposal_072315.pdf.
[2] EPA may add new sources to this list in the future.
[3] 40 CFR, Part 98, Subpart W (http://www.ecfr.gov/cgi-bin/text-idx?SID=68e8c5c1fb460b0cde0c1401850f7b26&mc=true&node=sp40.21.98.w&rgn=div6#se40.21.98_1234)

(through an EPA platform, to be developed) to allow the partners and EPA to comprehensively track progress towards commitments. For example, supplementary data would be needed to track progress on a partner's facilities that are not required to report to the GHGRP, and on sources and mitigation activities not currently covered by the GHGRP.[4]

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

- List of included facilities that report to Subpart W (facility ID)
- List of included facilities not reporting to Subpart W (a process will be developed for generating a facility ID for facilities that do not report to Subpart W)
- Applicable air regulations for included facilities, including a listing of the sources covered in the partner's Methane Challenge commitment that are affected by each regulation
- List of facilities acquired/divested during the reporting year

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

- **Emission Source**: For each Emission Source that a company has committed to address[5], the company would provide information on all occurrences of that source across company/unit operations. Data collection would include both unmitigated sources and sources that have implemented mitigation options (including supplementary information for those sources that have eliminated emissions completely, such as pneumatic controllers driven by instrument air).
- **Quantification Method**: For each Emission Source, there is a corresponding method or methods to quantify methane emissions. Most sources include one or more Quantification Methods from GHGRP Subpart W, which are used in GHGRP reporting and can also be used for supplemental reporting (e.g., for facilities that are not required to report to GHGRP Subpart W). EPA is considering the inclusion of other quantification methods that are supplemental to GHGRP Subpart W for certain emission sources, for which facilities could potentially select either the GHGRP or Methane Challenge Quantification Method for purposes of tracking Methane Challenge commitments.[6] EPA requests feedback on this approach.
- **Data Elements Collected via Facility-Level Reporting:** Each Quantification Method specifies all corresponding Data Elements to be reported by Partners. The table indicates data elements that are already included in GHGRP Subpart W reporting. Facilities not already reporting to Subpart W would report Data Elements through a supplemental reporting mechanism. Facilities already reporting to Subpart W would provide only supplemental data elements through the supplemental reporting mechanism.

For reporting purposes, the Methane Challenge Program intends to utilize the same segment and

[4] For example, distribution sector stakeholders have indicated interest in addressing emissions from distribution pipeline blowdowns and reporting the use of cast iron pipe liners, both of which are not reported to the GHGRP.
[5] As noted in the July Proposal, for the BMP Option, partners will only provide supplemental data for sources for which they have made commitments, while ONE Future partners would need to provide supplemental emissions data for all methane emission sources.
[6] Participation in Methane Challenge does not in any way change legal obligations of partners to comply with applicable regulations, including GHGRP Subpart W.

facility definitions as Subpart W, and these definitions are provided for reference in Appendix C. Data would be reported at the facility level, except where specified. Appendix A designates the specific source-segment combinations that are covered in this document.

Timeframe for Full Implementation of Methane Challenge Commitments

After Methane Challenge partner companies join the Program and establish their commitments, the next steps would be to submit, within 6 months of joining the Program, an Implementation Plan to specify milestones for achieving their commitments. EPA intends that partner companies would begin record-keeping as soon as possible and submit Annual Reports for the first full calendar year of Program participation, though EPA would consider accepting Annual Reports that reflect record-keeping for a partial year (e.g. the year the company joins the Program). One Future companies make a commitment to achieve a specified average rate of emissions intensity across all facilities within a specific segment by 2025. For the BMP Option, the July 2015 Methane Challenge Program proposal outlined a timeframe for implementation commitments not to exceed five (5) years from the commitment date. This has slightly different meanings, depending on the source and the nature of the mitigation options.

- For sources that achieve mitigation through technology implementation (pneumatic controllers, liquids unloading, tanks, reciprocating compressors and centrifugal compressors), partners commit to implement mitigation options for all sources included in their commitment (except those specifically exempted) by their designated target year (not to exceed five reporting years from commitment date).
- For sources that achieve mitigation through implementation of best practices/repair/replacement (pipeline venting and blowdowns, mains, services, excavation damages), partners commit to achieve the specified annual reduction/replacement/repair rate by their designated target year (not to exceed five reporting years from commitment date) and maintain at least that rate moving forward.

For equipment leaks/fugitive emissions and pneumatic pumps, EPA recognizes the potential overlap for coverage of this emissions source with on-going regulatory actions, including the proposed updates to NSPS and draft Control Techniques Guidelines. Methane Challenge intends to specify mitigation options that are consistent with regulatory approaches, with greater flexibility included in the voluntary Program as needed. Therefore, as a result of regulatory developments in process, a proposal for this commitment option will be phased-in at a later date.

Description of Emission Sources

Natural Gas Continuous Bleed Pneumatic Controllers

Source Description: Natural gas pneumatic controllers are automated instruments actuated by pressurized natural gas used for maintaining a process condition such as liquid level, pressure, delta-pressure and temperature. Continuous bleed means a continuous flow of pneumatic supply natural gas to the process control device (e.g. level control, temperature control, pressure control) where the supply gas pressure is modulated by the process condition, and then flows to the valve controller where the signal is compared with the process set-point to adjust gas pressure in the valve actuator. Pneumatic controllers in this document are equivalent to pneumatic devices as defined in the GHGRP.

This source focuses on continuous high-bleed controllers (those with natural gas bleed rate greater than

6 standard cubic feet per hour). This source does not cover operational situations in which pneumatic controllers with a bleed rate greater than 6 standard cubic feet (scf) per hour are required based on functional needs, including but not limited to response time, safety and positive actuation. Partner companies would track and report pneumatic controllers operating under these exceptions. Intermittent bleed pneumatic controllers are not included in this source category.

Mitigation Options:

- Utilize natural gas-actuated pneumatic controllers with a continuous bleed rate less than or equal to 6 scf of gas per hour, or
- Utilize zero emitting controllers (e.g. instrument air, solar, electric, or mechanical controllers), or
- Remove natural gas pneumatics controllers from service with no replacement.

Reporting:

Emission Source	Quantification Method	Data Elements Collected via Facility-Level Reporting[7]	GHGRP
Natural gas-actuated controllers with a bleed rate greater than 6 scf per hour	Subpart W Emission Factor(EF)[8]	Actual count of high-bleed pneumatic controllers[9]	X
		Average operating hours per high-bleed controller (hr/yr)	X
		Total CH_4 emissions from high-bleed controllers (mt CH_4)	X
		Number of high-bleed controllers claiming operational exemptions	
Natural gas-actuated controllers with a bleed rate less than or equal to 6 scf per hour	Subpart W EF[10]	Actual count of low-bleed pneumatic controllers[11]	X
		Average operating hours per low-bleed controller (hr/yr)	X
		Total CH_4 emissions from low-bleed controllers (mt CH_4)	X
Voluntary action to reduce methane emissions during the reporting year	Difference in emissions before and after mitigation[12]	Number of high-bleed controllers converted to low-bleed	
		Number of high-bleed controllers converted to zero emitting or removed from service	
		Number of low bleed controllers converted to zero emitting or removed from service	
		Emission reductions from voluntary action (mt CH_4)	

Fixed Roof, Atmospheric Pressure Hydrocarbon Liquid Storage Tanks

Source Description: Atmospheric pressure fixed roof storage tanks receiving hydrocarbon produced liquids from onshore petroleum and natural gas production and gathering and boosting facilities.

Mitigation Options:

[7] Pneumatic device data for onshore production and gathering and boosting facilities is aggregated at the basin level for reporting under subpart W, which is equivalent to reporting at the facility level. Data for the transmission compression and underground storage industry segments are aggregated at the facility level.
[8] 40 CFR 98.233(a)
[9] This source is equivalent to GHGRP "pneumatic devices"
[10] 40 CFR 98.233(a)
[11] This source is equivalent to GHGRP "pneumatic devices"
[12] As calculated per the specified emission quantification methodologies for each source.

- Route gas to a capture system (e.g. a vapor recovery unit or VRU) for beneficial use[13] to achieve at least a 95% reduction in methane emissions, or
- Route gas to a flare or control device[14] to achieve at least a 95% reduction in methane emissions.

Reporting

Emission Source	Quantification Method	Data Elements Collected via Facility-Level Reporting[15]	GHGRP
All atmospheric tanks in the basin or county	All methods	Count of tanks that vent directly to atmosphere	
		Count of tanks with vapor recovery system emission control measures	
		Count of tanks with flaring emission control measures	
		Annual CH_4 emissions from flashing in tanks that vent direct to atmosphere (mt CH_4)	
		Annual CH_4 emissions from flashing in tanks with vapor recovery units (mt CH_4)	
		Annual CH_4 gas quantities from tanks that control emissions with flaring (mt CH_4)	
For gas-liquid separators or gathering and boosting non-separator equipment (e.g., stabilizers, slug catchers) with annual average daily throughput of oil greater than or equal to 10 barrels per day, and for wells flowing directly flowing directly to atmospheric storage tanks without passing through a separator with throughput greater than or equal to 10 barrels per day: • Tanks venting to atmosphere • Tanks routing gas to a flare • Tanks routing gas to capture system for beneficial use	Subpart W calculation methods 1 or 2, adjusted as needed for vents routed to VRU (beneficial use) or flare[16]	Sub-Basin ID or county ID, as applicable depending on the industry segment	X
		Calculation method used	X
		Count of atmospheric tanks that vent directly to the atmosphere	X
		Count of atmospheric tanks with vapor recovery system emission control measures	X
		Count of atmospheric tanks with flaring emission control measures	X
		Annual CH_4 emissions from flashing in atmospheric tanks venting directly to the atmosphere (mt CH_4)	X
		Annual CH_4 emissions from flashing in atmospheric tanks equipped with vapor recovery systems (mt CH_4)	X
		Annual CH_4 emissions from flashing in atmospheric tanks that control emissions with flaring (mt CH_4)	X
For hydrocarbon liquids flowing to gas-liquid separators or non-separator equipment or directly to atmospheric storage tanks with throughput of oil less than 10	Subpart W calculation method 3, adjusted as needed for vents	Sub-Basin ID or county ID, as applicable depending on the industry segment	X
		Count of tanks that vent directly to atmosphere	
		Count of tanks equipped with vapor recovery system emission control measures	

[13] Beneficial use means routing natural gas for use such that the gas is not vented to the atmosphere or flared. This includes natural gas reinjection, electricity generation, natural gas liquefaction, and natural gas sales.
[14] Control device means any equipment used for oxidizing methane vapors. Such equipment includes, but is not limited to, enclosed combustion devices, flares, boilers, and process heaters.
[15] For reporting under subpart W, atmospheric tank counts and emissions data are aggregated at the sub-basin level for onshore production facilities, and at the county level for onshore gathering and boosting facilities.
[16] 40 CFR 98.233(j)(1); 40 CFR 98.233(j)(2)

Emission Source	Quantification Method	Data Elements Collected via Facility-Level Reporting[15]	GHGRP
barrels/day: • Tanks venting to the atmosphere • Tanks with gas routed to a flare • Tanks with gas routed to a capture system for beneficial use	routed to VRU (beneficial use) or flare[17]	Count of tanks with flaring emission control measures	X
		Annual CH_4 emissions from venting direct to atmosphere (mt CH_4)	
		Annual CH4 emissions from flashing in tanks equipped with vapor recovery systems (mt CH4)	
		Annual CH4 emissions from flashing in tanks that control emissions with flaring (mt CH_4)	X
Voluntary action to reduce methane emissions during the reporting year	Difference in emissions before and after mitigation[18]	Number of tanks routed to VRU or beneficial use	
		Number of tanks routed to flare or controls device	
		Emission reductions from voluntary action (mt CH4)	

Liquids Unloading

Source Description: Venting of methane emissions to the atmosphere during the process of removing liquids from a natural gas well to improve gas flow.

Mitigation Option:

- Minimize venting during the process of liquids unloading through use of technologies such as plunger lifts and smart well automation; swabbing the well to remove accumulated fluids; installing velocity tubing; and installing artificial lift systems.
- Track and report emissions for all wells conducting liquids unloading including the duration of the event, emissions associated with venting during liquids unloading, and the types of controls.

Reporting

Emission Source	Quantification Method	Data Elements Collected via Sub-Basin Level Reporting[19]	GHGRP
Liquids unloading for wells	Direct measurement for each tubing diameter and pressure group[20]	Tubing diameter and pressure group ID	X
		Well ID for each measured well in the group	X
		Average natural gas venting flow for each measured well in the group (scfh)	X
		Total duration of venting for each measured well in the	X

[17] 40 CFR 98.233(j)(3)

[18] As calculated per the specified emission quantification methodologies for each source.

[19] Under Calculation Method 1 in subpart W, emissions are measured for at least one well in each "tubing diameter and pressure group" per sub-basin, and these emissions are extrapolated to each unmeasured well in the same group and sub-basin based on actual unloading venting time per well. Facilities report the aggregated number of wells, duration of venting, and emissions in each well tubing diameter and pressure group with plunger lifts and without plunger lifts per sub-basin. Under Calculation Methods 2 and 3 in subpart W, facilities calculate emissions per well separately for wells with plunger lifts and for wells without plunger lifts. For reporting, facilities aggregate emissions at the sub-basin level from all liquids unloading events without plunger lifts and all liquids unloading events with plunger lifts, respectively.

[20] 40 CFR 98.233(f)(1), data elements will be reported separately for wells with plunger lifts and wells without plunger lifts

		group (hr/yr)	
		Annual CH_4 emissions for each measured well in the group (mt CH_4)	X
		Control types used for each measured well in the group (with or without plunger lifts)	X
		Number of wells conducting liquids unloading without plunger lifts that are vented to the atmosphere	X
		Number of wells conducting liquids unloading with plunger lifts that are vented to the atmosphere	X
		Cumulative CH_4 emissions from wells conducting liquids unloading without plunger lifts that are vented to the atmosphere (mt CH_4)	X
		Cumulative CH_4 emissions from wells conducting liquids unloading with plunger lifts that are vented to the atmosphere (mt CH_4)	X
		Number of wells conducting liquids unloading that use at least one of the listed control types	X
	Engineering calculations for wells without plunger lifts[21]	Number of wells without plunger lifts that vented to the atmosphere	X
		Cumulative annual number of unloadings for all wells	X
		Cumulative CH_4 emissions for all wells (mt CH_4)	X
		Cumulative total annual natural gas emissions (scf)	X
	Engineering calculations for wells with plunger lifts[22]	Number of wells with plunger lifts that vented to the atmosphere	X
		Cumulative annual number of unloadings for all wells	X
		Cumulative CH_4 emissions for all wells (mt CH_4)	X
		Cumulative total annual natural gas emissions (scf)	X
Voluntary action to reduce methane emissions during the reporting year	Difference in emissions before and after mitigation[23]	Number of wells reducing emissions voluntarily	
		Emission reductions from voluntary action (mt CH4)	

Centrifugal Compressors-venting

Source Description: Centrifugal compressor means any equipment that increases the pressure of a process natural gas by centrifugal action, employing rotating movement of the driven shaft. In wet seal centrifugal compressors, high-pressure oil is used as a barrier against escaping gas in centrifugal compressor shafts. Very little gas escapes through the oil barrier, but under high pressure, considerably more gas is absorbed by the oil. The seal oil is purged of the absorbed gas (using heaters, flash tanks, and degassing techniques) and recirculated; the centrifugal compressor wet seal degassing vent releases emissions when the high-pressure oil barriers for centrifugal compressors are depressurized to release absorbed natural gas. This source is focused on centrifugal compressors with wet seals.

[21] 40 CFR 98.233(f)(2)
[22] 40 CFR 98.233(f)(3)
[23] As calculated per the specified emission quantification methodologies for each source.

Mitigation Options:

- Route wet seal degassing to a capture system for beneficial use to achieve at least a 95% reduction in methane emissions, or
- Route wet seal degassing to flare or control device[24] to achieve at least a 95% reduction in methane emissions, or
- Use centrifugal compressors with dry seals.

Reporting

Emission Source	Quantification Method	Data Elements Collected via Facility-Level Reporting[25]	GHGRP
Each centrifugal compressor with wet seals	All methods, summary of information entered by compressor	Unique name or ID for the compressor	X
		Number of wet seals	X
		Hours in operating mode	X
		Which, if any, compressor sources are part of a manifolded group of compressor sources	X
		Indicate all of the following that apply to wet seal degassing emissions from the compressor during the year:	
		Emissions are vented to the atmosphere	
		Emissions are routed to flare	X
		Emissions are captured for fuel use or routed to a thermal oxidizer	X
		Emissions are routed to vapor recovery for beneficial use other than as fuel	X
		Compressor in not-operating-depressurized-mode all year	
All centrifugal compressors	Summation of method-specific data, entered by facility	Number of compressors with seal oil degassing emissions vented to the atmosphere	
		Annual CH_4 emissions to the atmosphere from wet seal oil degassing vents (including estimated fraction of CH_4 from manifolded vents) (mt CH_4)	
		Number of compressors routing wet seal oil degassing vents to flares, combustion units, or capture systems for beneficial use	
		Annual CH_4 emissions from flares and combustion units that is due to combustion of emissions from wet seal oil degassing vents (mt CH_4)	
		Number of centrifugal compressors with dry seals	
Centrifugal compressor with wet seal degassing vented to the atmosphere	As found or continuous measurement in operating mode of individual compressor wet seal degassing	Unique name or ID for the compressor	X
		Unique name or ID for the individual vent to the atmosphere	X
		Flow rate based on measurement type:	
		a. As found: Measured flow rate (scfh)	X
		b. Continuous: Measured volume of flow during the reporting year (MMscf)	X

[24] Control device means any equipment used for oxidizing methane vapors. Such equipment includes, but is not limited to, enclosed combustion devices, flares, boilers, and process heaters.

[25] Subpart W requires facilities to report certain information per compressor and other information per vent. Information reported per individual compressor vent is also specific to that one compressor.

	vent[26] [27]	Annual CH_4 emissions (mt CH_4)	X
	Site-specific EF[28]	Unique name or ID for the compressor	X
		Unique name or ID for the individual vent to the atmosphere	X
		Reporter EF (scfh)	X
		Number of measured compressors (during the current year and the 2 previous years) from which the reporter EF was developed	X
		Annual CH_4 emissions (mt CH_4)	X
Voluntary action to reduce methane emissions during the reporting year	Difference in emissions before and after mitigation[29]	Number of wet seal compressor de-gassing vents routed to VRU or beneficial use	
		Number of wet seal compressor de-gassing vents routed to flare or control device	
		Number of wet seal compressors converted to dry seal	
		Emission reductions from voluntary action (mt CH4)	

Reciprocating Compressors- Rod Packing Vent

Source Description: Reciprocating compressor means a piece of equipment that increases the pressure of a process natural gas by positive displacement, employing linear movement of a shaft driving a piston in a cylinder. Reciprocating compressor rod packing means a series of flexible rings in machined metal cups that fit around the reciprocating compressor piston rod to create a seal limiting the amount of compressed natural gas that escapes to the atmosphere. Rod packing emissions typically occur around the rings from slight movement of the rings in the cups as the rod moves, but can also occur through the "nose gasket" around the packing case, between the packing cups, and between the rings and shaft. As the rings wear, or if the fit between the rod packing rings and rod is too loose, more compressed natural gas can escape.

Mitigation Options:

- Replace the reciprocating compressor rod packing every 26,000 hours of operation, or
- Replace the reciprocating compressor rod packing prior to every 36 months, or
- Route rod packing vent to a capture system for beneficial use to achieve at least a 95% reduction in methane emissions, or
- Route rod packing vent to flare or control device[30] to achieve at least a 95% reduction in methane emissions.

Reporting

[26] 40 CFR 98.233(o)(1)(i)(A), (o)(2)(ii), (o)(6)(i), and (o)(11)

[27] 40 CFR 98.233(o)(1)(ii), (o)(3), (o)(7), and (o)(11)

[28] The site-specific emissions factor approach is used when an as found measurement for the compressor is conducted in not-operating-depressurized-mode during the year (and an as found measurement is not conducted in operating mode). The site-specific emissions factor is developed from as found measurements of individual seal oil degassing vent emissions from other compressors during the same year and the 2 previous years. 40 CFR 98.233(o)(1)(i)(A), (o)(2)(ii), (o)(6), and (o)(11)

[29] As calculated per the specified emission quantification methodologies for each source.

[30] Control device means any equipment used for oxidizing methane vapors. Such equipment includes, but is not limited to, enclosed combustion devices, flares, boilers, and process heaters.

Emission Source	Quantification Method	Data Elements Collected via Facility-Level Reporting[31]	GHGRP
Each reciprocating compressor	All methods, summary of information entered by compressor	Unique name or ID for the reciprocating compressor	X
		Hours in operating-mode	X
		Hours in standby-pressurized-mode	X
		Hours in not-operating-depressurized-mode	X
		Is rod packing replacement occurring every 26,000 hours or 36 months (Y/N)	
		Date of last rod packing replacement	
		Number of operating hours since rod packing replacement	
		Power output of the compressor driver (hp)	X
		Which, if any, compressor sources are part of a manifolded group of compressor sources	X
		Indicate all of the following that apply to rod packing venting emissions from the compressor during the year:	
		Emissions are vented to the atmosphere	
		Emissions are routed to vapor recovery	X
		Emissions are vented to flare	X
		Emissions are captured for fuel use or routed to a thermal oxidizer	X
		Compressor in not-operating-depressurized-mode all year	
All reciprocating compressors	Summation of method-specific data, entered by facility	Number of compressors with rod packing emissions vented to the atmosphere	
		For compressors vented to atmosphere, number with rod packing replacement every 26,000 hours or 36 months	
		Annual CH_4 emissions to the atmosphere from rod packing (including estimated fraction of CH_4 from manifolded compressor sources) (mt CH_4)	
		Number of compressors routing rod packing vents to flares, combustion units, or capture systems for beneficial use	
		Annual CH4 emissions from flares and combustion units due to combustion of emissions from rod packing vents (mt CH4)	
Reciprocating compressor rod packing vents	As found measurement or continuous measurement in operating mode of individual compressor[32] [33]	Unique name or ID for the compressor	X
		Unique name or ID for the individual vent to the atmosphere	X
		Flow rate based on measurement type:	
		a. As found: Measured volumetric flow at standard conditions from the rod packing vent (scf/hr)	X
		b. Continuous: Measured volumetric flow at standard conditions from the rod packing vent (MMscf)	X
		Annual CH_4 emissions (mt CH_4)	X
		Unique name or ID for the compressor	X
		Unique name or ID for the individual vent to the atmosphere	X

[31] Subpart W requires facilities to report certain information per compressor and other information per vent. Information reported per individual compressor vent is also specific to that one compressor.
[32] 40 CFR 98.233(p)(1)(i)(A), (p)(2)(ii), (p)(6)(i), and (p)(11)
[33] 40 CFR 98.233(p)(1)(ii), (p)(3), (p)(7), and (p)(11)

Emission Source	Quantification Method	Data Elements Collected via Facility-Level Reporting[31]	GHGRP
	Site-specific EF[34]	Reporter EF (scfh)	X
		Number of measured compressors (during the current year and 2 previous years) from which the reporter EF was developed	X
		Annual CH_4 emissions (mt CH_4)	X
Voluntary action to reduce methane emissions during the reporting year	Difference in emissions before and after mitigation[35]	Number of reciprocating compressors with rod packing vents routed to VRU or beneficial use	
		Number of reciprocating compressors with rod packing vents routed to flare or control device	
		Number of reciprocating compressors for which rod packing was replaced during reporting year	
		Emission reductions from voluntary action (mt CH4)	

Transmission Pipeline Blowdowns between Compressor Stations

Source Description: Blowdown means the release of gas from a pipeline or section of pipeline that causes a reduction in system pressure or a complete depressurization.

Mitigation Options:

- Route gas to a compressor or capture system for beneficial use, or
- Route gas to a flare, or
- Route gas to a low-pressure system by taking advantage of existing piping connections between high- and low-pressure systems, temporarily resetting or bypassing pressure regulators to reduce system pressure prior to maintenance, or installing temporary connections between high and low pressure systems, or
- Utilize hot tapping, a procedure that makes a new pipeline connection while the pipeline remains in service, flowing natural gas under pressure, to avoid the need to blow down gas.

The above mitigation options apply to both the BMP and ONE Future Options. However, for the BMP Options, partners would commit to maximize blowdown gas recovery and/or emission reductions through utilization of one or more of these options to reduce methane emissions from non-emergency blowdowns by at least 50% from total potential emissions each year. The total potential emissions would consist of calculated emissions from all planned maintenance activities in a calendar year[36], assuming the pipeline is mechanically evacuated or mechanically displaced using non-hazardous means down to atmospheric pressure and no mitigation is used.

Reporting:

[34] The site-specific emissions factor approach is used when an as found measurement for the compressor is conducted in standby-pressurized-mode or in not-operating-depressurized-mode during the year (and an as found measurement is not conducted in operating mode). The site-specific emissions factor is developed from as found measurements of individual rod packing vent emissions from other compressors during the same year and the 2 previous years. 40 CFR 98.233(p)(1)(i)(A), (p)(2)(ii), (p)(6), and (p)(11).

[35] As calculated per the specified emission quantification methodologies for each source.

[36] Total potential emissions amounts would likely be different each year.

Emission Source	Quantification Method	Data Elements Collected via Facility-Level GHGRP Reporting[37]	GHGRP
Pipeline blowdowns between compressor stations[38]	Subpart W Method 1, based on volume, temperature, and pressure[39]	Total number of blowdowns per equipment or event type[40]	X
		Total CH_4 emissions (Mt CH_4) per equipment or event type	X
	Subpart W Method 2, based on measurement[41]	Total number of blowdowns	
		Total CH_4 emissions (Mt CH_4)	X
Voluntary action to reduce methane emissions during the reporting year	Difference in potential and actual emissions[42]	Total number of blowdowns	
		Number of blowdowns that routed gas to a:	
		Mitigation option	
		Compressor or capture system for beneficial use	
		Flare	
		Low-pressure system	
		Number of hot taps utilized that avoided the need to blowdown gas to the atmosphere	
		Total CH_4 emissions (mt CH_4)	
		Total potential emissions (mt CH_4)	
		Emission reductions from voluntary action (mt CH4)	

Distribution Pipeline Blowdowns

Source Description: Blowdown means the release of gas from a pipeline or section of pipeline that causes a reduction in system pressure or a complete depressurization.

Mitigation Options:

- Route gas to a compressor or capture system for beneficial use, or
- Route gas to a flare, or
- Route gas to a low-pressure system by taking advantage of existing piping connections between high- and low-pressure systems, temporarily resetting or bypassing pressure regulators to reduce system pressure prior to maintenance, or installing temporary connections between high and low pressure systems, or
- Utilize hot tapping, a procedure that makes a new pipeline connection while the pipeline remains in

[37] Under Calculation Method 1, subpart W requires aggregated reporting of blowdown counts and emissions per equipment or event type at the facility level. Under Calculation Method 2, subpart W requires aggregated reporting of the emissions per facility, but the number of blowdown events or number of stacks monitored is not reported. For transmission pipeline facilities, subpart W also requires reporting the total number of blowdown events and total emissions aggregated over both methods at the state level.

[38] Emergency blowdown events are not included in this source for the BMP Option.

[39] 98.233(i)(2), based on the volume of pipeline segment between isolation valves and the pressure and temperature of the gas within the pipeline

[40] Event types are as follows: pipeline integrity work (e.g., the preparation work of modifying facilities, ongoing assessments, maintenance or mitigation), traditional operations or pipeline maintenance, equipment replacement or repair (e.g., valves), pipe abandonment, new construction or modification of pipelines including commissioning and change of service, operational precaution during activities (e.g. excavation near pipelines), and all other pipeline segments with a physical volume greater than or equal to 50 ft3.

[41] 98.233(i)(3), based on the measurement of emissions using a flow meter

[42] As calculated per the specified emission quantification methodologies for each source.

service, flowing natural gas under pressure, to avoid the need to blow down gas.

The above mitigation options apply to both the BMP and ONE Future Options. However, for the BMP Options, partners would commit to maximize blowdown gas recovery and/or emission reductions through utilization of one or more of these options to reduce methane emissions from non-emergency blowdowns of pipelines operating at 60 psi or more by at least 50% from total potential emissions each year. The total potential emissions would consist of calculated emissions from all planned maintenance activities in a calendar year[43], assuming the pipeline is mechanically evacuated or mechanically displaced using non-hazardous means down to atmospheric pressure and no mitigation is used.

Reporting:

Emission Source	Quantification Method	Data Elements Collected via Facility-Level GHGRP Reporting	GHGRP
Distribution Pipeline Blowdowns[44]	Subpart W calculation method 1 or 2 [45] [46]	Number of blowdowns	
		Total CH_4 emissions (Mt CH_4)	
Voluntary action to reduce methane emissions during the reporting year	Difference in potential and actual emissions[47]	Number of blowdowns that routed gas to a:	
		Mitigation option	
		Compressor or capture system for beneficial use	
		Flare	
		Low-pressure system	
		Number of hot taps utilized that avoided the need to blowdown gas to the atmosphere	
		Total CH_4 emissions (mt CH_4)	
		Total potential emissions (mt CH_4)	
		Emission reductions from voluntary action (mt CH4)	

M&R Stations/City Gates

EPA is seeking comment on the inclusion of this source in the Methane Challenge Program. GHGRP Subpart W data indicate a low level of emissions from this source relative to other distribution sources. Recent studies have also indicated that upgrades to M&R Station/City Gates that have been implemented in recent years (as discussed in Lamb et al.[48]) have resulted in lower emissions from this source. EPA is seeking feedback on whether there is a significant population of M&R Stations/City Gates that have not made upgrades, and whether to include this source in the Program.

Mains – Cast Iron and Unprotected Steel

[43] Total potential emissions amounts would likely be different each year.
[44] Emergency blowdown events and blowdowns of pipelines operating at less than 60 psi are not included in this source for the BMP Option.
[45] 98.233(i)(2), based on the volume of pipeline segment between isolation valves and the pressure and temperature of the gas within the pipeline
[46] 98.233(i)(3), based on the measurement of emissions using a flow meter
[47] As calculated per the specified emission quantification methodologies for each source.
[48] http://pubs.acs.org/doi/full/10.1021/es505116p

Source Description: Distribution mains are natural gas distribution pipelines that serve as a common source of supply for more than one service line.[49] This source covers cast iron and unprotected steel mains (steel mains without cathodic protection).

Mitigation Options:

- Replace cast iron mains with plastic or cathodically protected steel and replace or cathodically protect unprotected steel mains, or
- Rehabilitate cast iron and unprotected steel pipes with plastic pipe inserts, also referred to as slip-lining or u-liners, or cured-in-place liners:
  - Slip-lining is a technique that involves the insertion of a plastic pipe into an existing pipe. The new pipe is pushed or pulled into the host pipe.[50] U-liners are high-density polyethylene (HDPE) plastic piping and are manufactured in a "U" shape with diameter sizing specific to the host pipe in need of repair. The liner is pulled through the host pipe and then reformed to a circular shape after insertion using steam. This process is carried out without the need to trench and results in a structurally sound HDPE plastic pipe fitted tightly within the pipe needing repair.[51] PHMSA provides guidance related to inserting plastic pipe into a metal pipe.
  - Cured-in place liners are pipe liners comprised of flexible tubing, jackets, elastomer skin, and adhesive systems. These liners are installed into an existing metallic natural gas pipe in need of rehabilitation. Cured-in place liners provide resistance to gas permeation and provide resistance against damage caused by ground movement, internal corrosion, leaking joints, pinholes, and chemical attacks.[52]

The above mitigation options apply to both the BMP and ONE Future Options. However, for the BMP Options, partners would commit to replace or rehabilitate cast iron and unprotected steel mains at the following minimum annual rates (which are based on a partner's total inventory of cast iron and unprotected steel mains) per the mitigation options listed above.

Tier	Inventory of Cast Iron and Unprotected Steel Mains	% Annual Replacement/Repair
Tier 1	<500 miles	6.50%
Tier 2	500-1,000 miles	5%
Tier 3	1,001 – 1,500 miles	3%
Tier 4	1,501 miles – 3000 miles	2%
Tier 5	>3000 miles	1.5%

Reporting:

Emission Source	Quantification Method[53]	Data Elements Collected via Facility-Level GHGRP Reporting	GHGRP
Distribution mains - cast iron - gas service	Subpart W cast iron mains EF	Total miles of cast iron distribution mains	X
		Annual CH_4 emissions (mt CH_4)	X
Distribution mains - plastic -	Subpart W plastic	Total miles of plastic distribution mains	X

[49] http://primis.phmsa.dot.gov/comm/glossary/index.htm?nocache=1606#Main
[50] http://www.istt.com/guidelines/slip-lining
[51] http://www.astm.org/Standards/F1504.htm
[52] http://www.astm.org/Standards/F2207.htm
[53] 40 CFR 98.233(r) and Table W-7 to Subpart W of Part 98.

Emission Source	Quantification Method[53]	Data Elements Collected via Facility-Level GHGRP Reporting	GHGRP
gas service	mains EF	Annual CH_4 emissions (mt CH_4)	X
Distribution mains - protected steel - gas service	Subpart W protected steel mains EF	Total miles of protected steel distribution mains	X
		Annual CH_4 emissions (mt CH_4)	X
Distribution mains - unprotected steel - gas service	Subpart W unprotected steel mains EF	Total miles of unprotected steel distribution mains	X
		Annual CH_4 emissions (mt CH_4)	X
Distribution mains - cast iron or unprotected steel with plastic liners or inserts - gas service	Subpart W plastic mains EF	Total miles of cast iron or unprotected steel distribution mains with Plastic Liners or Inserts*	
		Annual CH_4 emissions* (mt CH_4)	
Voluntary action to reduce methane emissions during the reporting year	Difference in emissions before and after mitigation[54]	Miles of cast iron mains:	
		Replaced with plastic	
		Replaced with protected steel	
		Rehabilitated with plastic pipe inserts or cured-in-place liners	
		Miles of unprotected steel mains:	
		Cathodically protected or replaced with protected steel	
		Rehabilitated with pipe inserts or cured-in-place liners	
		Emission reductions from voluntary action (mt CH4)	

*The reporting of this supplemental data may result in duplicate reporting for some facilities reporting into Subpart W. The Methane Challenge Program would develop a process to reconcile any potential duplications that occur.

Unprotected Steel and Cast Iron Services

Source Description: A service line is a distribution line that transports gas from a common source of supply to (1) a customer meter or the connection to a customer's piping, whichever is farther downstream, or (2) the connection to a customer's piping if there is no customer meter. (A customer meter is the meter that measures the transfer of gas from an operator to a consumer.)[55] This source covers cast iron and unprotected steel services.

Mitigation Options:

- Replace unprotected steel and cast iron services with copper, plastic, or protected steel that meet the manufacturing requirements and qualifications provided in 49 CFR Part 192, Subpart B[56], or
- Rehabilitate cast iron and unprotected steel services with plastic pipe inserts.

EPA requests feedback on how to structure the BMP commitment option for this source. For example, should the Program specify a minimum rate of replacement/rehabilitation for services (e.g. using the same concept as proposed for distribution mains)? If so, what should that rate be? Or is there another standard that the Program should specify to direct commitments under this source (e.g. all services

[54] As calculated per the specified emission quantification methodologies for each source.
[55] http://primis.phmsa.dot.gov/comm/glossary/index.htm?nocache=1606#ServiceLine
[56] http://www.ecfr.gov/cgi-bin/text-idx?SID=06dfe10fe465d0ee1b352dad32b2c248&mc=true&node=sp49.3.192.b&rgn=div6

should be repaired/replaced for every main replacement/rehabilitation)?

Reporting:

Emission Source	Quantification Method [57]	Data Elements Collected via Facility-Level Reporting	GHGRP
Distribution services - cast iron - gas service	TBD	Total number of cast iron services	
		Annual CH_4 emissions (mt CH_4)	
Distribution services - copper - gas service	Subpart W copper services EF	Total number of copper services	X
		Annual CH_4 emissions (mt CH_4)	X
Distribution services - plastic - gas service	Subpart W plastic services EF	Total number of plastic services	X
		Annual CH_4 emissions (mt CH_4)	X
Distribution services - protected steel - gas service	Subpart W protected steel services EF	Total number of protected steel services	X
		Annual CH_4 emissions (mt CH_4)	X
Distribution services - unprotected steel - gas service	Subpart W unprotected steel services EF	Total number of unprotected steel services	X
		Annual CH_4 emissions (mt CH_4)	X
Distribution services - cast Iron or unprotected steel with plastic liners or inserts - gas service	Subpart W plastic services EF	Total number of cast iron or unprotected steel services with plastic liners or inserts*	
		Annual CH_4 emissions* (mt CH_4)	
Voluntary action to reduce methane emissions during the reporting year	Difference in emissions before and after mitigation[58]	Number of cast iron services:	
		Replaced with plastic	
		Replaced with protected steel	
		Replaced with copper	
		Rehabilitated with plastic pipe inserts	
		Number of unprotected steel services:	
		Cathodically protected or replaced with protected steel	
		Replaced with plastic	
		Replaced with copper	
		Rehabilitated with plastic pipe inserts	
		Emission reductions from voluntary action (mt CH4)	

*The reporting of this supplemental data may result in duplicate reporting for some facilities reporting into GHGRP Subpart W. The Methane Challenge Program would develop a process to reconcile any potential duplications that occur.

Excavation Damages

Source Description: Excavation damage may include damage to the external coating of the pipe, or dents, scrapes, cuts, or punctures directly into the pipeline itself. Excavation damage often occurs when required One-Call notifications are not made prior to beginning excavation, digging, or plowing activities. When the location of underground facilities is not properly determined, the excavator may

[57] 40 CFR 98.233® and Table W-7 to Subpart W of Part 98.
[58] As calculated per the specified emission quantification methodologies for each source.

inadvertently – and sometimes unknowingly – damage the pipeline and its protective coating.[59]

Mitigation Options:

- Shorten average time to shut-in for all damages, or
- Reduce the number of damages per thousand locate calls, or
- Undertake targeted programs to reduce excavation damages, including patrolling systems when construction activity is higher, excavator education programs (811, call before you dig), identifying and implementing steps to minimize repeat offenders, and stand-by efforts, or
- Conduct incident analyses (e.g. by identifying whether excavation, locating, or One-Call practices were not sufficient) to inform process improvements and reduce excavation damages.

The above mitigation options apply to both the BMP and ONE Future Options. However, for the BMP Options, partner companies will use the collected data to set a company-specific goal for reducing methane emissions from excavation damages by implementing the above actions to reduce excavation damage incidents and/or methane emissions from incidents.

Reporting:

Emission Source	Quantification Method	Data Elements Collected via Facility-Level GHGRP Reporting	GHGRP
Excavation damages – natural gas distribution network	Company-specific quantification method based on best available information – incident-specific reporting	Unique damage incident identifier	
		Date	
		Class location of incident[60]	
		Material involved in the incident (steel, cast iron, copper, plastic etc.)	
		Approximate size of mechanical puncture	
		Was the pipeline shut down? (Y/N)	
		Part of system involved in incident and material involved (main, service, inside meter/regulator set, etc.)	
		If part of system is a main or service, nominal diameter of pipe	
		Estimated volume of methane released (mt CH_4)	
		Estimated pressure at the point and time of the incident	
		Was a supervisory control and data acquisition-based system in place on the pipeline or facility involved in the incident? (Y/N)	
	Company-specific quantification method based on best available information –	Total number of excavation damages per thousand locate calls	
		Total estimate of natural gas released in a calendar year	
		Total number of excavation damage incidents where the operator was given prior notification of excavation activity	
		Total number of excavators in a calendar year by type that caused excavation damage incidents[61]	

[59] http://primis.phmsa.dot.gov/comm/FactSheets/FSExcavationDamage.htm

[60] Class 1 location, Class 2 location, Class 3 location, Class 4 location

[61] Contractor, Railroad, County, State, Developer, Utility, Farmer, Municipality, Occupant, Unknown/Other, Data not collected

	overall reporting	Total number of excavation damages by apparent root cause[62]	
Voluntary action to reduce methane emissions during the reporting year	Difference in emissions before and after mitigation (if applicable)[63]	Actions taken to minimize excavation damages/reduce methane emissions from excavation damages	
		Company-specific goal for reducing methane emissions from excavation damages (when available)	
		Progress in meeting company-specific goal	
		Emission reductions from voluntary action (mt CH4)	

[62] One-Call Notification Practices, Locating Practices, or Excavation Practices not Sufficient; One-Call Notification Center Error, Abandoned Facility, Deteriorated Facility, Previous Damage, Data not Collected, Other Outside Force Damage, Pipe, Weld or Joint Failure, Equipment Failure, Incorrect Operation, Other/Miscellaneous

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

Appendix A: Proposed Sources for BMP Commitment Option

The following table lists recommended methane emission sources that EPA is considering for inclusion in the BMP commitment option at the time of Program launch, as per the July Program proposal.[64]

Sectors	Sources
Onshore Production and Gathering and Boosting	Pneumatic controllers
	Equipment leaks/fugitive emissions
	Liquids unloading
	Pneumatic pumps (only chemical injection pumps (CIP))
	Tanks
Natural Gas (NG) Processing	Reciprocating compressors-venting
	Centrifugal compressors-venting
NG Transmission & Underground Storage	Reciprocating compressors-venting
	Centrifugal compressors-venting
	Equipment leaks/fugitive emissions
	Pipeline venting & blowdowns
	Pneumatic controllers
NG Distribution	M&R stations/city gates
	Mains – Cast Iron, not cathodically protected steel (bare and coated)
	Services
	Blowdowns
	Excavation damages

[64] Note that in this document some source names have been updated since the July proposal.

Appendix B: Questions for Stakeholders

EPA encourages stakeholders to provide comments on any and all aspects of this document. EPA will carefully consider and evaluate all feedback received through the feedback deadline. To the extent appropriate, applicable, and consistent with the aims of the Methane Challenge Program, this feedback will be incorporated into a revised framework document. Following are specific areas in which EPA encourages stakeholders to provide feedback:

1. Are potential partners interested in reporting measured methane emissions for any sources that currently don't include measurement in the quantification options? Please comment on this and, if so, provide information on recommended measurement protocols for sources of interest.
2. Should intermittent pneumatic controllers be included in the Pneumatic Controllers source? EPA seeks recommendations on whether and how to include intermittent controllers.
3. For Tanks, EPA seeks comment on whether additional elements collected under GHGRP should be considered for tracking purposes for the Methane Challenge Program.
4. What types of situations require operators to vent to the atmosphere instead of capturing emissions during liquids unloading? How could this information best be captured in the reported data?
5. For liquids unloading, are there additional supplemental data elements or quantification methods needed to demonstrate that operators are minimizing emissions during liquids unloading?
6. EPA seeks feedback on methodologies for calculating and tracking centrifugal compressor seal oil degassing and reciprocating compressor rod packing methane emissions for the following operational situations:
    a. Compressors that route seal oil degassing/rod packing vents to manifolded vents that include sources other than seal oil degassing (e.g. blowdown vents) or seal oil degassing/rod packing emissions from multiple centrifugal compressors.
    b. Compressors that route seal oil degassing/rod packing vents to flare, a thermal oxidizer, or vapor recovery for beneficial use other than as fuel.
7. EPA seeks feedback on methodologies for calculating methane emission reductions for centrifugal compressors that convert from wet seals to dry seals.
8. For transmission and distribution blowdowns, EPA requests feedback on the proposal of 50% as the minimum reduction percentage commitment, and whether the minimum commitment should be adjusted to serve as an appropriate stretch goal for partner companies.[65] Is the proposed methodology for calculating potential emissions from this source appropriate? The proposed methodology assumes full evacuation of the pipeline to atmospheric pressure; are there circumstances in which companies don't lower pipeline pressure all the way to atmospheric levels, such that using this basis for calculating potential emissions could overstate potential emissions?
9. For distribution mains, EPA requests feedback on the proposed percentage replacement rates, which include a new proposed category for companies with an inventory of >3000 miles of cast iron and unprotected steel mains.
10. EPA seeks feedback on the proposal to use the plastic pipe EF for "Distribution Mains - Cast Iron or Unprotected Steel with Plastic Liners or Inserts" and "Distribution Services - Cast Iron or Unprotected Steel with Plastic Liners or Inserts."
11. For distribution mains and services, should "vintage" plastic pipe or "Century" plastic pipe be included with cast iron and unprotected steel in this category (Aldyl A and LDIW Aldyl A

[65] For blowdowns, partners commit to achieve the specified annual reduction rate by their designated target year (not to exceed five reporting years from commitment date) and maintain at least that rate moving forward.

Polyethylene gas piping manufactured from 1965 through 1972 and plastic piping extruded by Century Utility Products Inc. from Union Carbide Corporation's DHDA 2077 manufactured between 1970 and 1973 respectively)? In particular, EPA seeks input on whether companies have sufficient available activity data (e.g. known inventories of vintage plastic pipe and annual information on plastic pipeline material) such that they can commit to and track replacement levels, and if so how emissions of this type of pipe should be quantified (e.g. are material- or age-specific emissions factors available?).

12. For cast iron services, EPA seeks comment on how to quantify methane emissions, and requests quantification methodology suggestions, including any available data.
13. For distribution mains, EPA seeks feedback on whether to include as a mitigation option use of internal or external joint sealants for cast iron pipes greater than 20" in diameter. In particular, EPA seeks feedback about the ability to implement other mitigation options for these pipes (e.g. slip-lining), which reinforce the joints as well as the pipeline. EPA requests commenters to provide relevant supporting data with their response, if available.
14. For excavation damages, EPA seeks comment on whether to limit the scope of this source to pipe operating at 15 psi or greater, or whether it should cover excavation damages on all pipe.
15. Because many excavation damages are technically out of the control of companies, EPA is proposing company-specific goal setting to participate in the Program. We request feedback on this approach, in particular whether companies would be able to set emission reduction targets versus other targets (e.g. reducing number of damages, reducing average shut-in time for all damages, other qualitative targets).
16. EPA requests feedback on how to quantify methane emissions/gas releases from excavation damages. Is there publically available data on recommended calculation methods for quantifying emissions from this source? Are there any circumstances under which it would be appropriate to use an emission factor (e.g. GRI/EPA or Lamb et al.)?
17. The Natural Gas STAR Program Annual Reporting Forms specify Sunset Dates (the length of time a technology or practice can continue to accrue emission reductions after implemented) for mitigation options (http://www3.epa.gov/gasstar/tools/program-forms.html). Should the Methane Challenge Program create a similar structure to establish Sunset Dates for designated mitigation options?
18. The Methane Challenge Program seeks to stimulate new action to reduce methane emissions while also recognizing past actions undertaken by partners. For some sources, such historic action will be clear through proposed reporting (e.g. facilities that have converted high-bleed pneumatic controllers will show a low number of high-bleeds relative to low-bleed and zero emitting controllers). For other sources, such as cast iron pipe, a low level or nonexistent cast iron could reflect a historic replacement program or the fact that the facility never had such pipe. For practice-based programs, such as that proposed for excavation damages, companies may already have taken steps to reduce damages such that they cannot expect to achieve significantly lower levels. Should the Methane Challenge Program create a mechanism to specifically recognize historic action for certain sources? If so, how could the Program recognize such previous action (for example, by allowing these companies to join the Program and collecting and posting relevant details on previous action prior to joining the Program)?

Appendix C: Segment and Facility Definitions

Onshore 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 CO_2 or natural gas injection.

A facility means all natural gas equipment on a single well-pad or associated with a single well-pad and CO_2 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.

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.

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.

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. In addition, 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.

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.