

Natural Gas STAR and Methane Challenge Program Updates

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*Transmission & Storage Technology Transfer Workshop
Glen Allen, VA
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Natural Gas STAR Program Updates

Natural Gas STAR Program Overview



- Natural Gas STAR program established in 1993 to increase awareness of oil and gas methane emission sources and share innovative ways to reduce emissions
- Significant innovation and capacity building achieved over 25 years
- Promotes over 50 mitigation best practices
- Key goals of technology transfer, training, and capacity building through technical documents and workshops
- Over 90 partners across the natural gas value chain

Natural Gas STAR Reporting Overview

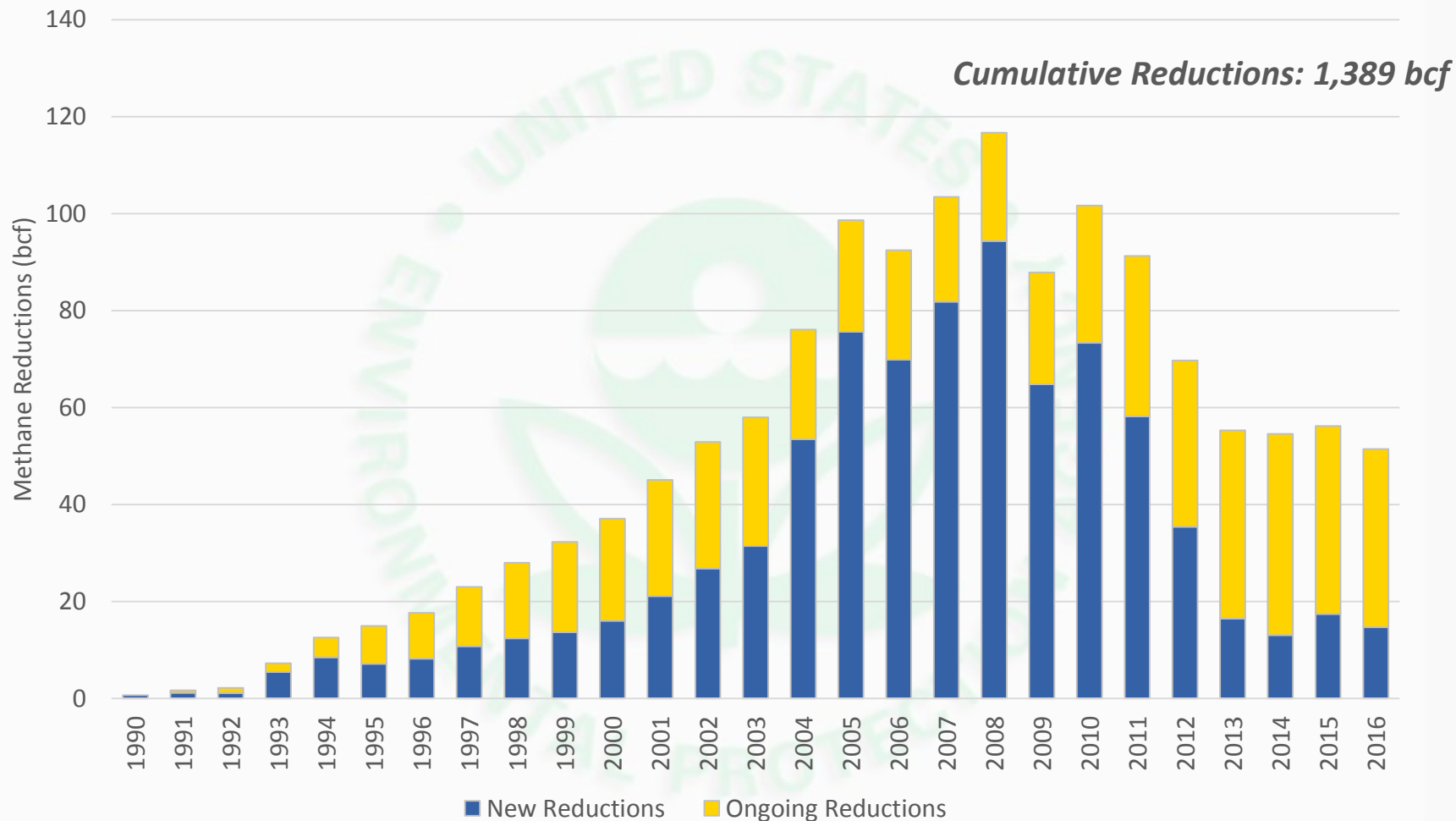


- Reporting is an essential aspect of the program, used to:
 - Track program progress
 - Recognize partner efforts to reduce methane emissions
- Partners report through an online reporting tool
 - Individual emission reductions are aggregated to annual emission reductions for the overall program
- Most popular mitigation technologies are highlighted
 - Helps identify topics for technology transfer workshops
- Partners receive customized annual summary report
 - Partners can choose to share their accomplishments
- Cumulatively, Gas STAR Partners have reduced nearly 1.39 trillion cubic feet of methane emissions since the Program began

Natural Gas STAR Accomplishments



Natural Gas STAR Reductions*

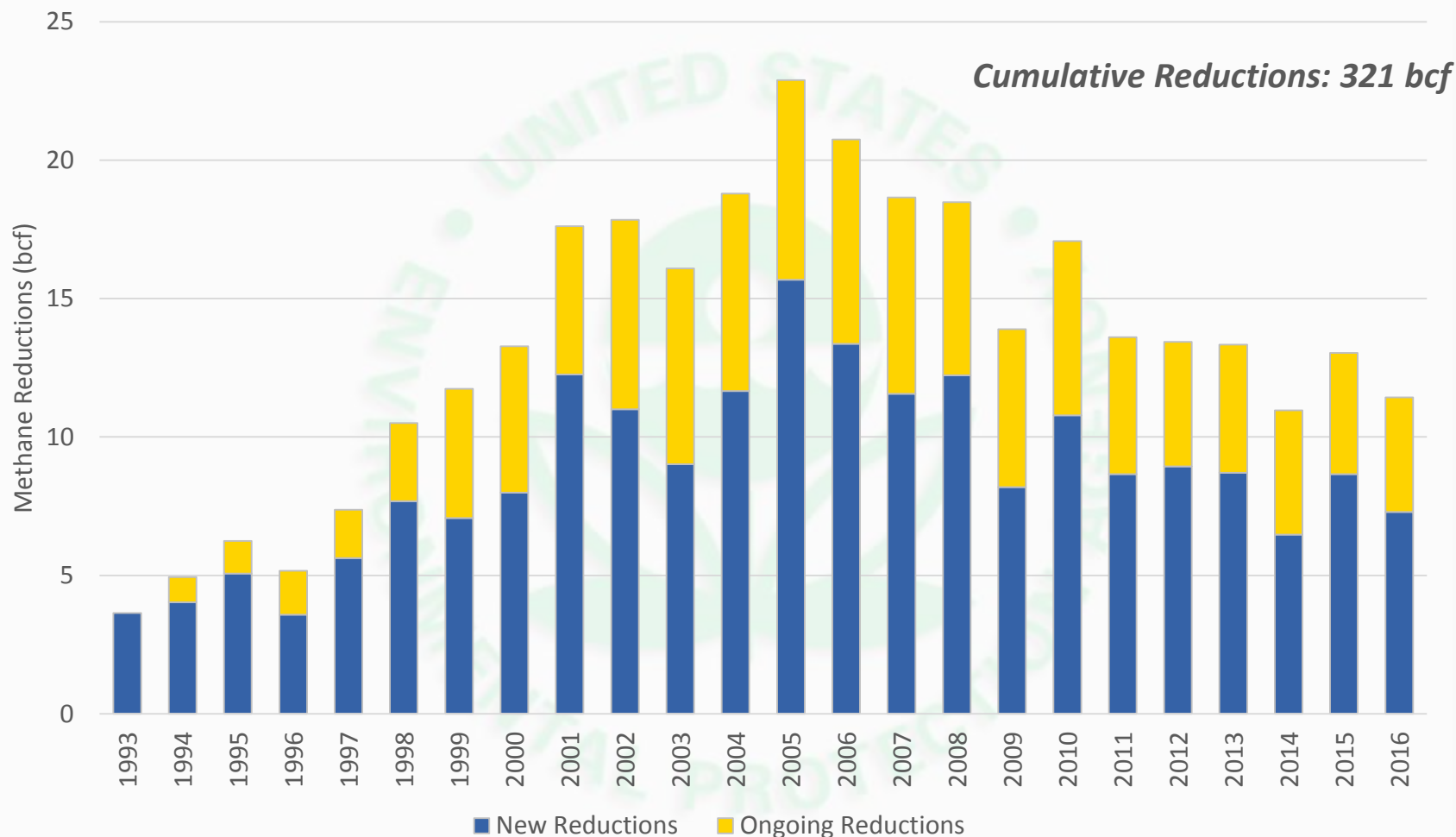


**These figures reflect data received to date; the Program occasionally receives late/revised submissions and totals may not match previously published values*

Natural Gas STAR Accomplishments Transmission Segment



Natural Gas STAR Reductions, Transmission Segment*

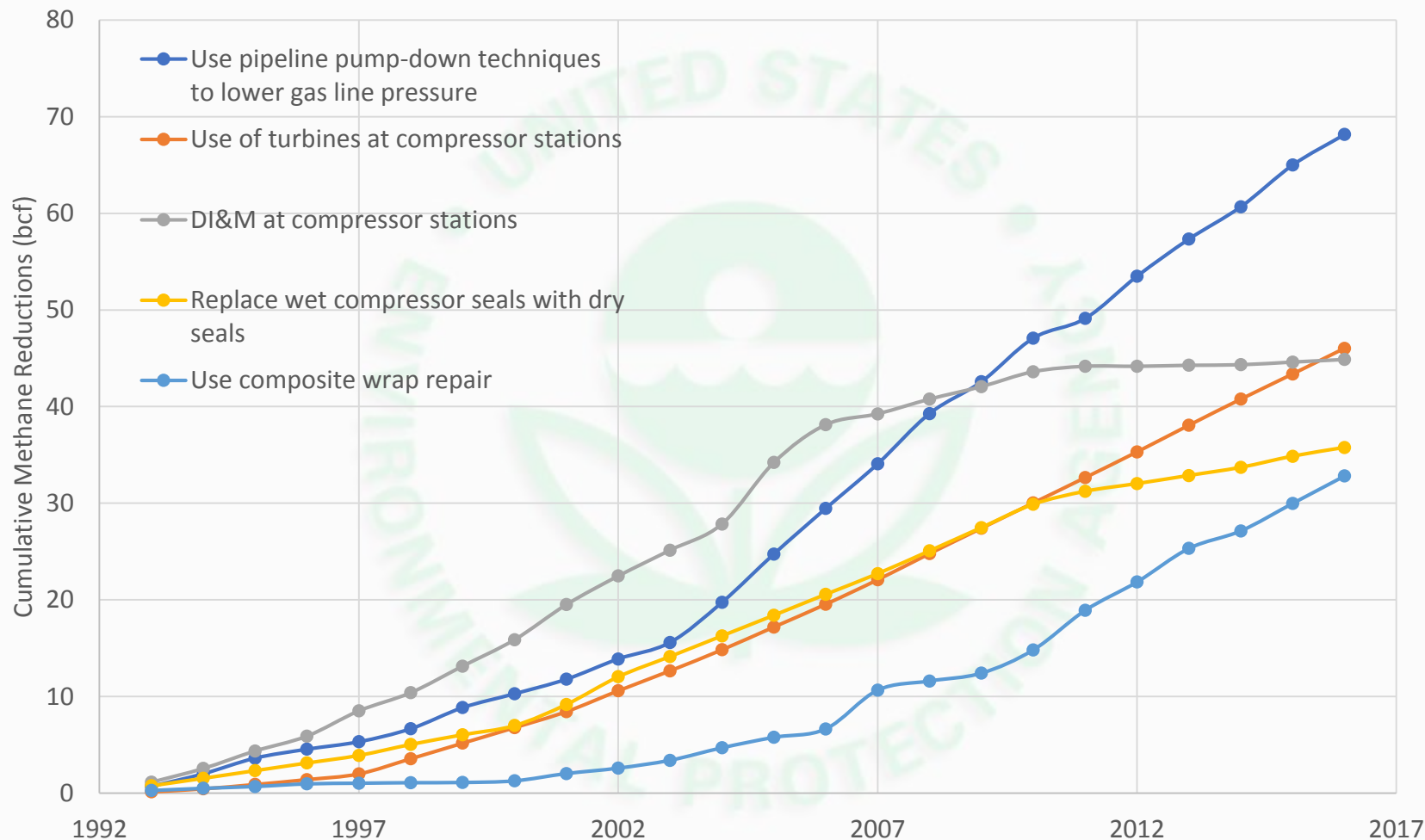


*These figures reflect data received to date; the Program occasionally receives late/revised submissions and totals may not match previously published values

Natural Gas STAR Accomplishments Transmission Segment



Top 5 Technologies and Practices in the Transmission Segment*



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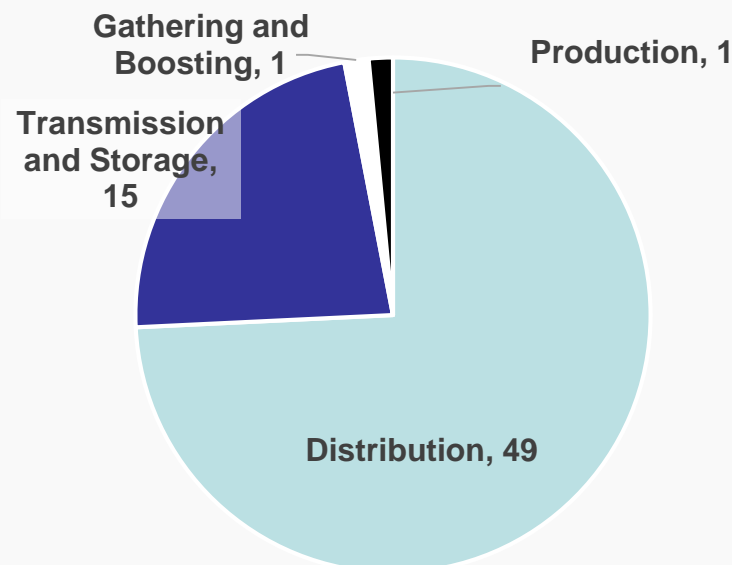
Natural Gas STAR Methane Challenge Program Updates

Natural Gas STAR Methane Challenge Program Overview



- **Methane Challenge expands the Natural Gas STAR Program**
 - Specific, ambitious commitments
 - Transparent reporting
 - Company-level recognition of commitments and progress
- **Two commitment options for enhanced flexibility:**
 - Best Management Practice (BMP) Commitment
 - ONE Future Emissions Intensity Commitment
- **Sector coverage:**
 - Onshore oil production
 - Entire natural gas value chain from onshore production through distribution
- **Currently 52 BMP partners and 4 ONE Future partners**

Methane Challenge Partners by Industry Segment



Natural Gas STAR Methane Challenge Reporting Overview



- Sandbox Testing for full partnership (Sept – Oct 2017)
- BMP Commitment Option Pilot Reporting (Nov 2017 – Feb 2018)
 - Purpose: to test processes of data collection, data assimilation, and annual report development from seven volunteer parent companies
 - Incorporated feedback from reporting system Sandbox Testing
 - Feedback: pilot reporters found the report submission process to be user-friendly; few technical bugs in the forms or e-GGRT module were encountered
- Information Collection Request approval pending
 - Approved ICR required per Paperwork Reduction Act
 - Requires 2 notices published in Federal Register and chance for public comment
 - First Federal Register Notice published December 14, 2016
 - Second Federal Register Notice published April 12, 2018; 30 day public comment period closed May 14, 2018
 - Office of Management & Budget review ongoing; approval pending



Natural Gas STAR Methane Challenge Reporting Pilot



- Tested e-GGRT reporting system with a group of volunteer partners beginning in Nov 2017
- Submitted real data from 2016 reporting year
- Allowed us to resolve a few technical issues in the system before all partners report
- Gave us an opportunity to develop a data analysis plan and process
- Plan to publish pilot data to website this summer

All BMP Partner Commitments



Onshore Production	Gathering and Boosting	Natural Gas Processing	Transmission and Storage	Distribution
Pneumatic Controllers	Pneumatic Controllers	Reciprocating Compressors - Rod Packing Vent	Reciprocating Compressors - Rod Packing Vent <i>5 Partners</i>	Mains – Cast Iron and Unprotected Steel <i>30 Partners</i>
Fixed Roof, Atmospheric Pressure Hydrocarbon Liquid Storage Tanks	Pneumatic Pumps	Centrifugal Compressors - Venting	Centrifugal Compressors - Venting <i>2 Partners</i>	Services – Cast Iron and Unprotected Steel <i>14 Partners</i>
Pneumatic Pumps	Fixed Roof, Atmospheric Pressure Hydrocarbon Liquid Storage Tanks		Equipment Leaks/Fugitive Emissions	Distribution Pipeline Blowdowns <i>3 Partners</i>
	Reciprocating Compressors - Rod Packing Vent <i>1 Partners</i>		Pipeline Blowdowns between Compressor Stations <i>4 Partners</i>	Excavation Damages <i>22 Partners</i>
	Centrifugal Compressors - Venting		Pneumatic Controllers <i>1 Partner</i>	

	20+ Partners
	10 – 19 Partners
	1 – 9 Partners

Pilot Partner Commitments



Onshore Production	Gathering and Boosting	Natural Gas Processing	Transmission and Storage	Distribution
Pneumatic Controllers	Pneumatic Controllers	Reciprocating Compressors - Rod Packing Vent	Reciprocating Compressors - Rod Packing Vent	Mains – Cast Iron and Unprotected Steel <i>8 Partners</i>
Fixed Roof, Atmospheric Pressure Hydrocarbon Liquid Storage Tanks	Pneumatic Pumps	Centrifugal Compressors - Venting	Centrifugal Compressors - Venting	Services – Cast Iron and Unprotected Steel <i>1 Partner</i>
Pneumatic Pumps	Fixed Roof, Atmospheric Pressure Hydrocarbon Liquid Storage Tanks		Equipment Leaks/Fugitive Emissions	Distribution Pipeline Blowdowns
	Reciprocating Compressors - Rod Packing Vent		Pipeline Blowdowns between Compressor Stations <i>1 Partner</i>	Excavation Damages <i>5 Partners</i>
	Centrifugal Compressors - Venting		Pneumatic Controllers	

	5-8 Pilot Reporters
	1 Pilot Reporter
	No Pilot Reporters (but commitment made under full membership)

2016 Pilot BMPs Reported



Transmission Pipeline Blowdowns between Compressor Stations

Route gas to a compressor or capture system for beneficial use

Route gas to a flare

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

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

Mains – Cast Iron and Unprotected Steel

Replace cast iron mains with plastic or cathodically protected steel and replace or cathodically protect unprotected steel mains

Rehabilitate cast iron and unprotected steel pipes with plastic pipe inserts, also referred to as sliplining or u-liners, or cured-in-place liners

Services – Cast Iron and Unprotected Steel

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

Rehabilitate cast iron and unprotected steel services with plastic pipe inserts or liners

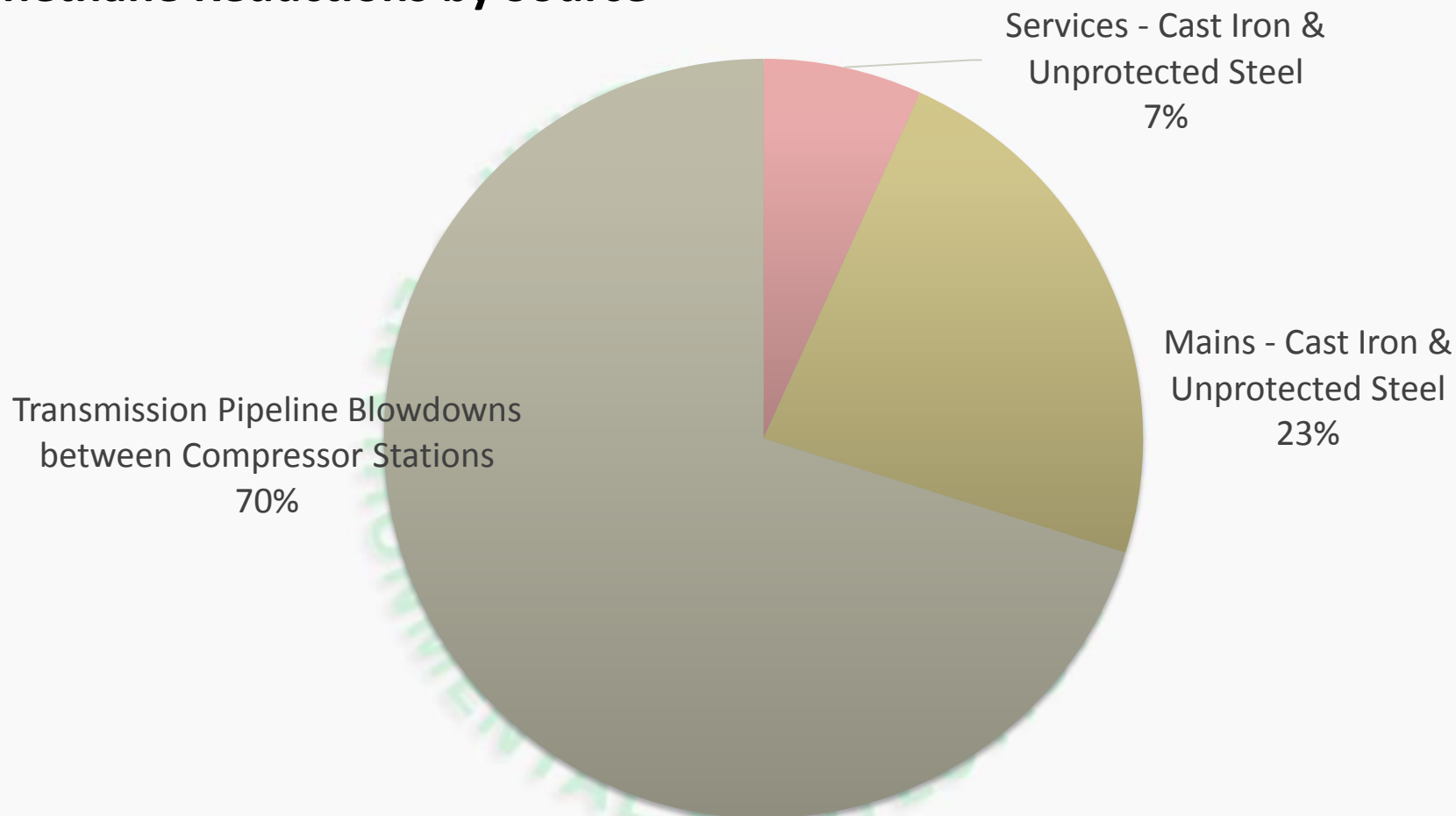
Excavation Damages

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

Undertake targeted programs to reduce excavation damages and/or shorten time to shut-in when damages do occur, 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



Methane Reductions by Source*



Pilot reporters reported methane reductions of ~170,000 MTCO₂eq in RY2016

**There are currently no reductions associated with the Excavation Damages source.*



Partner Profiles:

- Show individual partner progress towards achieving their commitments
- Provide access to partners' reported data
- Present data in an easy-to-understand format

We are pleased to provide an initial look at an *in-progress* partner profile and data download

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Natural Gas STAR Program

Methane Challenge Partner Profile: Dominion Energy Transmission, Inc.

Natural Gas STAR Partner Since 2011 | Methane Challenge Partner Since 2016

About Dominion Energy: Headquartered in Richmond, VA, Dominion Energy [NYSE: D] is one of the nation's largest producers and transporters of energy, with a portfolio of approximately 26,000 megawatts of electric generation, 66,000 miles of natural gas transmission, gathering, storage and distribution pipeline and 64,500 miles of electric transmission and distribution lines. Dominion Energy operates one of the largest natural gas storage systems in the U.S. with approximately 1 trillion cubic feet of capacity, and serves nearly 6 million utility and retail energy accounts. Dominion Energy's natural gas operations span the entire value chain from production to local distribution. Dominion Energy's natural gas transmission, gathering, and storage pipelines operate in 11 states—Colorado, Georgia, Maryland, New York, Ohio, Pennsylvania, South Carolina, Utah, Virginia, West Virginia, and Wyoming. Dominion Energy's natural gas distribution systems operate in Idaho, Ohio, Utah, West Virginia, and Wyoming.

Commitments: Dominion Energy Transmission, Inc. has committed to apply best management practices to mitigate methane emissions from the following emission source across their operations:

- [Transmission Pipeline Blowdowns between Compressor Stations](#)



Website: <https://www.dominionenergy.com/> [EXIT](#)

Implementation Plan

Download Dominion Energy Transmission, Inc.'s Methane Challenge Implementation Plan here.

Download Data

Download all Dominion Energy Transmission, Inc.'s Methane Challenge reported data here.

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Partner Profile Page - Data Dictionary

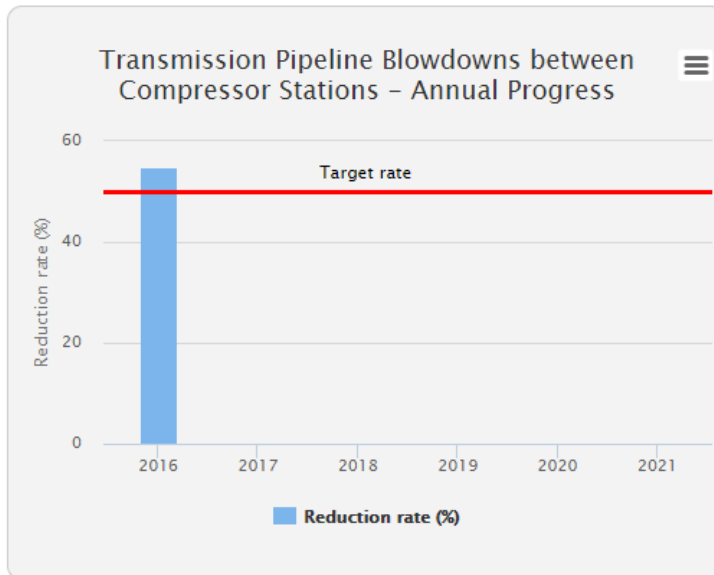


COLUMN_NAME					
	COLUMN_NAME	DATA_ELEMENT	DATA_TYPE	DATA_UNITS	
2	PARTNER_NAME	Name of partner that reported	Text	NA	
3	FACILITY_NAME	Name of facility the data were reported for	Text	NA	
4	MCFACILITY_ID	Unique Methane Challenge program ID for the facility reported on	ID	NA	
5	REPORTING_YEAR	Year during which reported activities/emissions/reductions occurred	Integer	Year	
6	TRANSBLOWDOWNS_COUNT_PIPEINTEGRITYWORK	Total number of blowdowns - Pipeline integrity work (e.g., the preparation work of modifying facilities, ongoing assessments, maintenance or mitigation) (Method 1)	Integer	Count of blowdowns	
7	TRANSBLOWDOWNS_EMISSIONS_PIPEINTEGRITYWORK	Total CH4 emissions - Pipeline integrity work (e.g., the preparation work of modifying facilities, ongoing assessments, maintenance or mitigation) (Method 1)	Numeric	Metric tons of methane	
8	TRANSBLOWDOWNS_COUNT_PIPELINEOEM	Total number of blowdowns - Traditional operations or pipeline maintenance (Method 1)	Integer	Count of blowdowns	
9	TRANSBLOWDOWNS_EMISSIONS_PIPELINEOEM	Total CH4 emissions - Traditional operations or pipeline maintenance (Method 1)	Numeric	Metric tons of methane	
10	TRANSBLOWDOWNS_COUNT_EQUIPREPLACEREPAIR	Total number of blowdowns - Equipment replacement or repair (e.g., valves) (Method 1)	Integer	Count of blowdowns	
11	TRANSBLOWDOWNS_EMISSIONS_EQUIPREPLACEREPAIR	Total CH4 emissions - Equipment replacement or repair (e.g., valves) (Method 1)	Numeric	Metric tons of methane	
12	TRANSBLOWDOWNS_COUNT_PIPEABANDONMENT	Total number of blowdowns - Pipe abandonment (Method 1)	Integer	Count of blowdowns	
13	TRANSBLOWDOWNS_EMISSIONS_PIPEABANDONMENT	Total CH4 emissions - Pipe abandonment (Method 1)	Numeric	Metric tons of methane	
14	TRANSBLOWDOWNS_COUNT_NEWCONSTRUCTIONMOD	Total number of blowdowns - New construction or modification of pipelines including commissioning and change of service (Method 1)	Integer	Count of blowdowns	
15	TRANSBLOWDOWNS_EMISSIONS_NEWCONSTRUCTIONMOD	Total CH4 emissions - New construction or modification of pipelines including commissioning and change of service (Method 1)	Numeric	Metric tons of methane	
16	TRANSBLOWDOWNS_COUNT_OPRECAUTION	Total number of blowdowns - Operational precaution during activities (e.g. excavation near pipelines) (Method 1)	Integer	Count of blowdowns	
17	TRANSBLOWDOWNS_EMISSIONS_OPRECAUTION	Total CH4 emissions - Operational precaution during activities (e.g. excavation near pipelines) (Method 1)	Numeric	Metric tons of methane	
18	TRANSBLOWDOWNS_COUNT_OTHER	Total number of blowdowns - All other pipeline segments with a physical volume greater than or equal to 50 cubic feet (Method 1)	Integer	Count of blowdowns	
19	TRANSBLOWDOWNS_EMISSIONS_OTHER	Total CH4 emissions - All other pipeline segments with a physical volume greater than or equal to 50 cubic feet (Method 1)	Numeric	Metric tons of methane	
	TRANSBLOWDOWNS_COUNT_FLOWMETER	Total number of blowdowns - Calculated using flow meter (Method 2)	Integer	Count of blowdowns	

Prototype web pages – under review



Progress Toward Achieving Methane Challenge Program Commitments



Transmission Pipeline Blowdowns between Compressor Stations

For more information about this source, see the [BMP Commitment Option reference page](#)

Segment: Transmission & Storage

Target Reduction Rate: 50%

Target Year: 2021

Current Reduction Rate: 54.8%

First Year Target Rate Achieved: 2016

Dominion Energy Transmission, Inc. has implemented this commitment by routing gas to low-pressure systems and by using hot taps.

Graph shows: Dominion Energy Transmission, Inc.'s annual progress towards achieving, and maintaining, their target rate of reducing methane emissions from blowdowns from planned maintenance activities by at least 50% annually.

Show/Hide Data



Transmission Pipeline Blowdowns Between Compressor Stations

Applicable Segments: Transmission and Storage

About This Source: Blowdowns are the release of gas from a pipeline or section of pipeline that causes a reduction in system pressure or a complete depressurization.

Available 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.

What This Commitment Entails: Partners commit to maximize blowdown gas recovery and/or emission reductions through utilization of one or more of these mitigation options to reduce methane emissions from non-emergency blowdowns by at least 50% from total potential emissions each year (partners may choose to commit to a higher rate). A partner commits to achieve, and maintain, its specified annual emission reduction rate by its designated commitment achievement date.

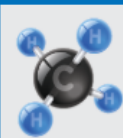
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Partner Profile Page



Partner Reductions

Since joining the Methane Challenge program, Dominion Energy Transmission, Inc. has achieved the following methane emissions reductions, which are also expressed in terms of carbon dioxide equivalent and the value of the amount of natural gas saved.



Methane
Emissions
Reductions

4,787 metric tons of CH₄



Carbon
Dioxide
Equivalent

119,667 metric tons of CO₂ equivalent



Natural Gas
Savings

\$747,919 of natural gas saved*

*Natural gas savings assumes a natural gas price of \$3.00 per thousand cubic feet, based on the average of daily Henry Hub Natural Gas Spot Prices in 2016, rounded to the nearest dollar

Thank you!



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Upcoming Events

- Natural Gas STAR Program reports due June 15, 2018
- Renewable Natural Gas Webinar (June 14, 2018)
- Data-driven Decision Making Tech Transfer Workshop (August 2018)
- Renewable Natural Gas Tech Transfer Workshop (October 2018)