



Pipeline and Hazardous Materials Safety Administration
Office of Pipeline Safety

Pipeline Safety Research & Development Program

Workgroup#5: Methane Mitigation – Construction and Operations

Steve Nanney

December 1, 2021



U.S. Department of Transportation
**Pipeline and Hazardous Materials
Safety Administration**

PHMSA: Your Safety is Our Mission



Good Morning & Welcome!

- PHMSA Leader:** Steve Nanney, Senior Technical Advisor
- Industry Co-Leader:** Zach Keith, Manager,
Environmental Sciences, Williams
- Industry Co-Leader:** Adam Stickl, Materials Engineer, Washington Gas
- Industry Co-Leader:** Nick Medina, Public and Government Affairs
Manager, ExxonMobil Pipeline Company

Thank you for choosing this Workgroup

We have an important charge for you:

- Listening/Learning
- Assist in developing PHMSA's future research agenda



Workgroup Objectives

1. Updating the audience on the challenges and funded research to date associated with this workgroup subject.
2. Identifying technical gaps that address key challenges.
3. Developing a list of important topics for future PHMSA funded research from identified gaps.



Agenda at a Glance



Today's Agenda – December 1

Time	Presentation	Speaker
10:00 AM	Introduction to Workgroup	<i>Workgroup Leader PHMSA</i>
		<i>Workgroup Leader Industry</i>
10:30 AM	Research Funding Organization Presentations	<i>Presenters 1-4</i>
11:30 AM	Q&A	
12:00 PM	Contractor Support Introduction & Description	<i>S&K Facilitate</i>
12:10 PM	Research Gap Brainstorming Session	<i>Workgroup Participants</i>
12:45 PM	Lunch Break & CAAP Poster Presentations <i>Similar gaps will be combined during lunch.</i>	
2:45 PM	Review Combined Gaps	<i>Workgroup Leaders</i>
3:15 PM	Sticky Note Exercise – Round 1 & 2 <i>Workgroup prioritizes R&D Gaps</i>	<i>S&K Facilitate</i>
4:15 PM	Break	
4:30 PM	Workgroup Research Topic Roadmapping	<i>Workgroup Leaders & Participants</i>
6:00 PM	Workgroup Closeout <i>Day 2 Closeout</i>	<i>Workgroup Leader</i>



Thursday's Agenda – December 2

10:00 AM **PHMSA's Year-Round R&D Solicitation**

10:10 AM **Workgroup Readouts**

The results of this Workgroup will be presented at 10:10 a.m. tomorrow ETZ.

Return to the event meeting page to find the entry link to Day 3.



PHMSA Funded Research

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PHMSA Related Research

	Program Total	Methane Leak Detection Total
Total R&D projects funded since 2002	361	29
Total R&D investment through PHMSA:	\$163 M	\$13.9 M
Technology projects funded:	112	15
Commercialized technologies:	33	6

Projects have researched an array of topics, such as:

- Detection thresholds for both laser and sampling-based sensors
- Leak rate estimation models
- Investigating machine learning to evaluate detection data
- Validation studies with different deployment platforms
 - Fixed wing, helicopter, drones, vehicle & hand-held/fixed



Notable Related Impacts

High Rate of Technology Transfer & Patent Activity

Technology Improvements

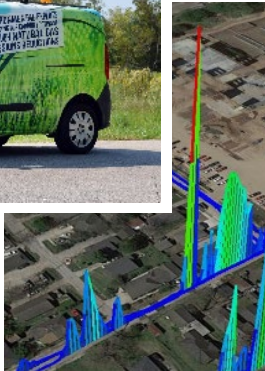
- Increased detection threshold
- Fixed wing: Wider inspection swath path, faster flight & data processing

Knowledge Transfer

American Society for Testing and Materials D.22 Committee



Pictures courtesy of Heath Consultants, Inc.



Pictures courtesy of Ball Aerospace & Technologies Corp.



Picture courtesy of Northeast Gas Association.



Related Policy Issues



Policy Drivers

PIPES Act of 2020 – Sections 113 and 114

Executive Orders

NTSB recommendations on leak detection



PIPES 2020 Section 113

Section 113 amends Section 60102 of Title 49.

Requires, in one year, the Secretary must issue final regulations requiring the following classes of operators to conduct leak detection and repair (LDAR) programs in order to **“(a) meet the need for gas pipeline safety and (b) protect the environment.”**

- 1) Operators of regulated gathering lines in Class 2, Class 3, or Class 4 locations;
- 2) Operators of new and existing gas transmission pipeline facilities; and
- 3) Operators of new and existing gas distribution pipeline facilities.



PIPES 2020 Section 114(a)

- **Section 114(a)** is a self-executing provision that **requires operators** to update their Operations and Maintenance Plan **by 12/28/2021** to:
 - Address elimination of hazardous leaks and **minimizing releases of natural gas from pipeline facilities.**
 - Consider replacement or remediation of pipelines that are known to leak based on the material, design or past operating and maintenance experience (cast iron, unprotected steel, wrought iron, and plastics with known issues).



PIPES 2020 Section 114

- **Section 114(d) requires PHMSA to conduct a study by June 28, 2022 discussing:**
 - 1) The best available technologies or practices to prevent or minimize release of natural gas when making planned repairs, replacement, or maintenance.
 - 2) The best available technologies or practices to prevent or minimize release of natural gas when operator intentionally vents or releases natural gas, including blowdowns.
 - 3) Pipeline facility designs that mitigate the need to intentionally vent natural gas.
- **Section 114(d) then directs PHMSA to update the Pipeline Safety Regulations accordingly.**



NTSB Most Wanted List

Improve Leak Detection and Mitigation

NTSB states that the “threat to public safety merits a comprehensive ‘fast-track’ regulatory approach by PHMSA, and industry should implement leak-detection and mitigation measures in advance of regulation to help shape regulatory action.”

NTSB states that Regulators should:

- Require all NG transmission and distribution pipeline operators to equip their supervisory control and data acquisition systems with tools to recognize and pinpoint leak-locations. (PHMSA)
- Require the installation of automatic shutoff valves or remote-control valves in high-consequence areas and in class 3 and 4 locations. (PHMSA)
- Require all new service regulators be installed outside occupied structures and existing interior service regulators be relocated whenever the gas service line, meter, or regulator is replaced. Multifamily structures should be prioritized over single-family dwellings. (PHMSA)
- *Require methane-detection systems in residential occupancies with gas service. (International Code Council/Gas Technology Institute/NFPA)*

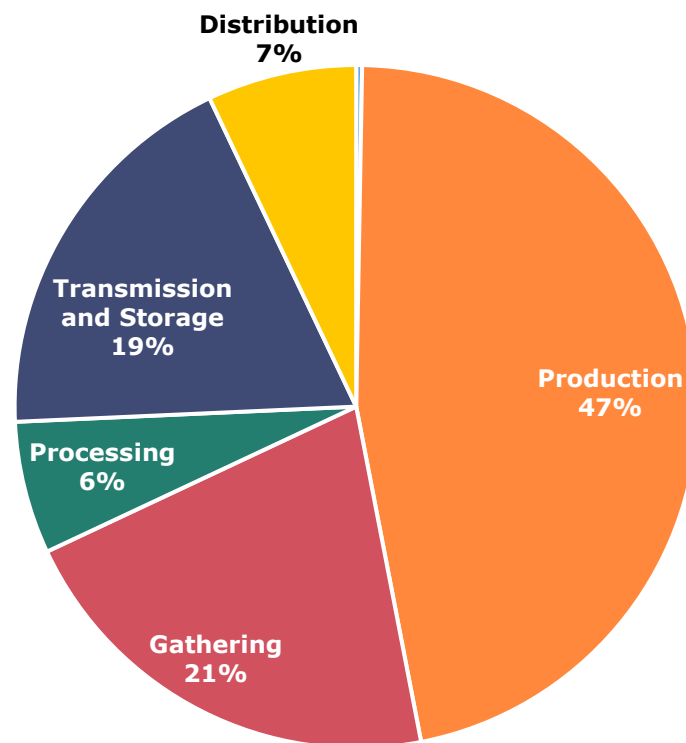


O&G Industry Methane Emission Estimates

U.S. Environmental Protection Agency (EPA). Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHG Inventory): 1990-2019. February 12, 2021.

Year 2019 Data – EPA GHG Inventory

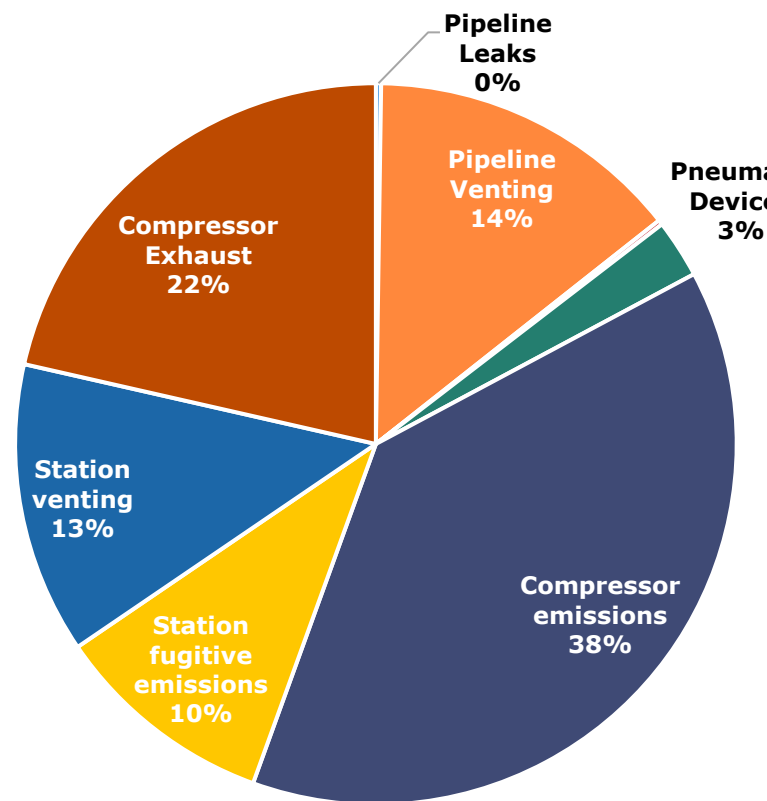
Source	Kt CH4*	MMcf
Exploration	22	1,402
Production	3,700	235,856
Gathering	1,670	106,454
Processing	497	31,681
Transmission and Storage	1,478	94,215
Distribution	560	35,697
Total	7,927	505,306
Data for 2019		



Data – Gas Transmission

Year 2019 Data – EPA GHG Inventory

Source	Kt CH4	MMcf CH4
Pipeline Leaks	3.3	210
Pipeline Venting (maintenance and upset)	199.4	12,708
Pipeline Venting (normal operation)	3.0	193
Pneumatic Devices	36.9	2,355
Compressor emissions	541.0	34,486
Station fugitive emissions	140.6	8,961
Station venting	184.4	11,754
Compressor Exhaust	302.6	19,291
Total	1,411.2	89,958



Vented Emission - Sources

Most gas transmission emissions are vented emissions, with sources including:

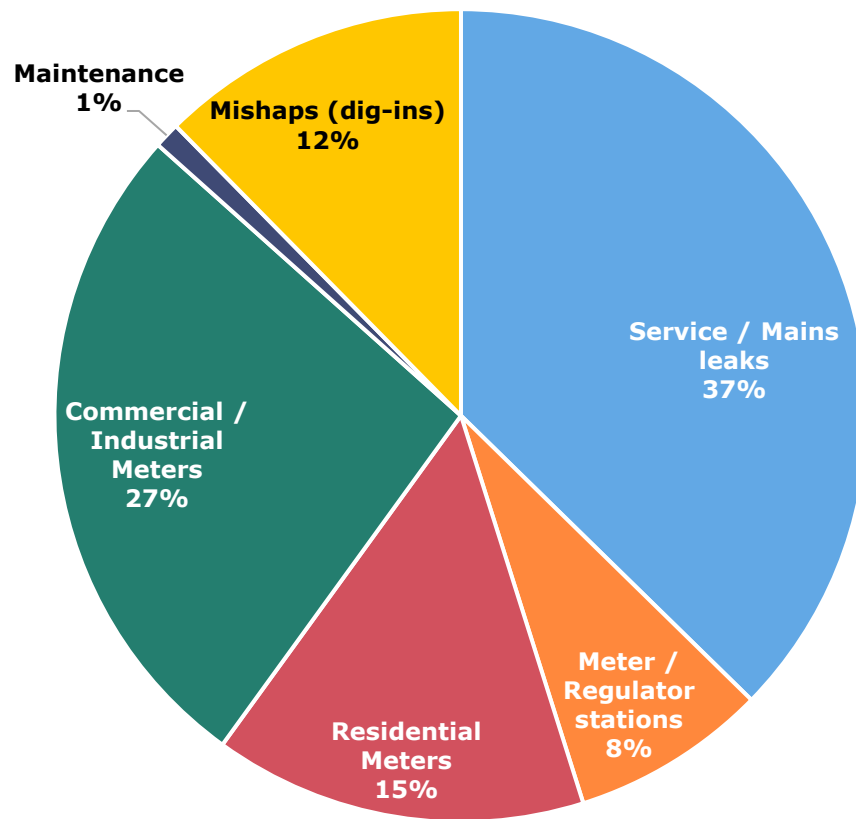
- Blowdowns associated with repairs / maintenance, and replacement / construction,
- Vents from equipment such as pressure relief devices, regulators (gas use), emergency shut down devices (ESD),
- Ruptures and Major leaks (incidents),
- Current facility / equipment designs, and
- Section 114(d) study to help identify pipeline facilities' vented emissions sources.



Data – Gas Distribution

Year 2019 Data – EPA GHG Inventory

Source	Kt CH4*	MMcf
Service / Mains leaks	209.0	13,321
Meter / Regulator stations	43.7	2,786
Residential Meters	83.1	5,300
Commercial / Industrial Meters	149.0	9,500
Maintenance	5.7	364
Mishaps (dig-ins)	69.3	4,417
Total	559.8	35,688



Fugitive Emissions - Sources

Most gas distribution emissions are ‘fugitive emissions’, which most often come from:

- Problematic pipe, especially cast iron and bare-steel systems, or plastic systems with known problems.
- Commercial/industrial meter sets.
- Compressor stations.
- Residential meter sets.
- Excavation damage and other incidents.



Possible Mitigation Measures for a Pipeline

- **Gas Leakage Surveys and Remediation**
- **Right-of-Way Patrols**
- **Gas Release Mitigation techniques, such as:**
 - Using valves or newly-installed control fittings to isolate shorter pipeline segment lengths near the pipe being replaced;
 - Flaring gas released from the pipeline nearest to the isolation valves;
 - Reducing pressure in the pipeline segment with inline compression;
 - Reducing pressure with mobile compression sourced from the isolation valves nearest to the pipe being replaced;
 - Transferring gas to lower pressure pipeline system or segment from the nearest isolation valves to the pipe being replaced, such as through a lateral delivering gas to another pipeline facility; or
 - An alternative method demonstrated to minimize the release of gas to the environment like the techniques listed in the methods above.



Thank You!

Research Program Contacts

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