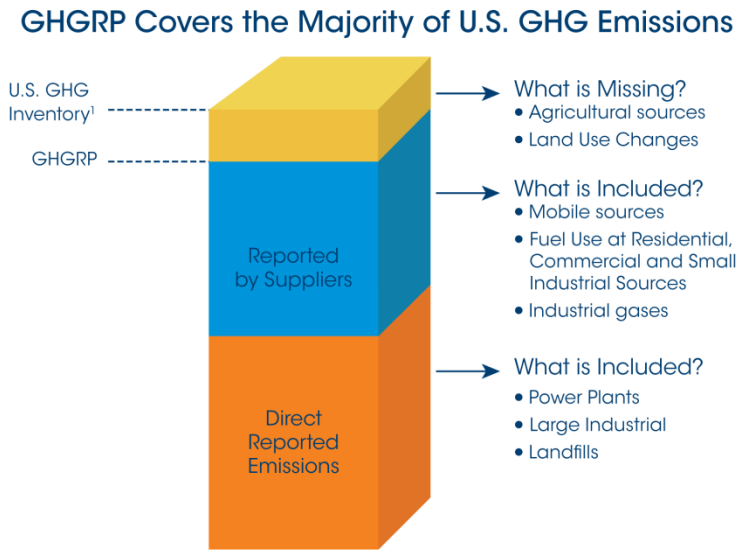
EPA Oil and Gas GHG Emissions Data

May 5, 2021

U.S. GHG Inventory (GHGI) and GHG Reporting Program (GHGRP)

- Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHG Inventory) tracks total annual U.S. emissions across all sectors of the economy using national-level data
- GHGRP collects detailed emissions data from large greenhouse gas emitting facilities in the United States, as directed by the Clean Air Act
  - GHGRP covers most, but not all, U.S. GHG emissions
  - GHGRP does not include agriculture, land use, and small sources



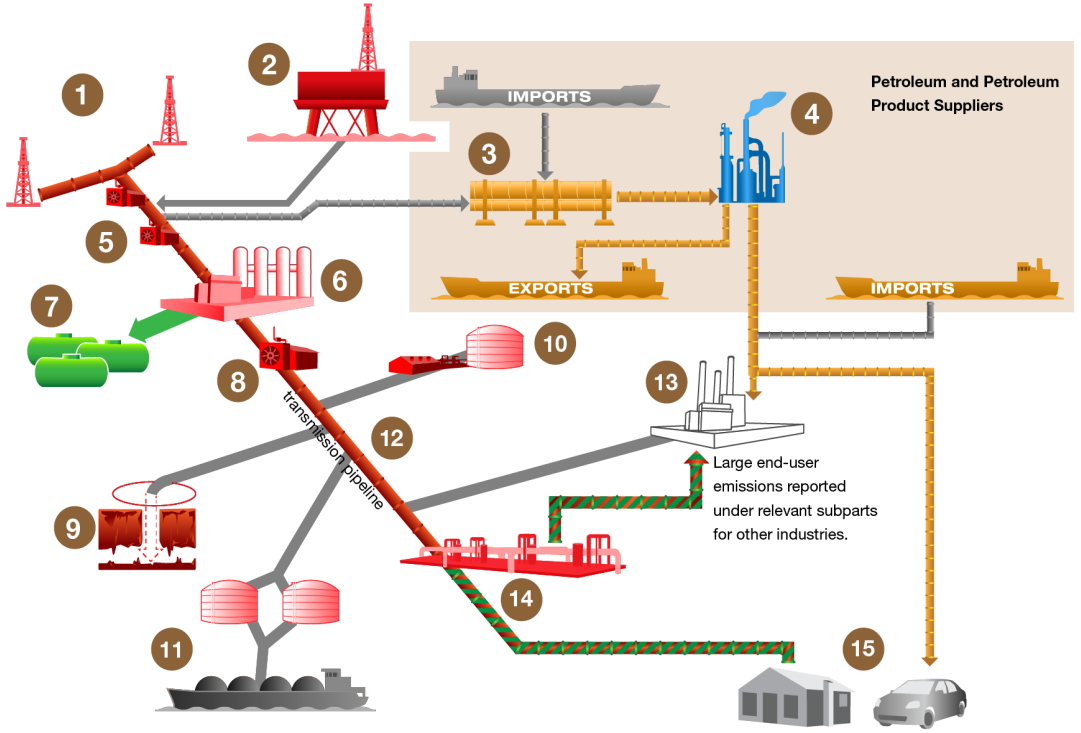
Task	Inventory of U.S. GHG Emissions and Sinks	Greenhouse Gas Reporting Program
Find total U.S. emissions	✓	
Review trend data for the past 20 years	✓	
Browse a map to find largest emitters in your area		✓
Compare facility emissions across an industrial sector		✓
Find reported emissions by state		✓

Overview of Greenhouse Gas Reporting Program (GHGRP)

- Launched in response to FY 2008 Consolidated Appropriations Act
- Annual reporting of GHGs by 41 source categories
- Facilities use uniform methods prescribed by the EPA to calculate GHG emissions, such as direct measurement, engineering calculations, or emission factors derived from direct measurement
- In some cases, facilities have a choice of calculation methods for an emission source
- Direct reporting to EPA electronically
- EPA verification of GHG data

GHGRP Subpart W (Petroleum & Natural Gas Systems)

- Covers numerous emission sources across the oil and gas value chain
- Reporting by facilities with annual GHG emissions greater than or equal to 25,000 metric tons CO_2 equivalent (CO_2e)
- In general, a "facility" for purposes of the GHGRP means all co-located emission sources that are commonly owned or operated
- However certain industry segments (e.g., onshore production, gathering and boosting, transmission pipelines, distribution) have unique "facility" definitions



Production & Processing

1. Onshore Petroleum & Natural Gas Production
2. Offshore Petroleum & Natural Gas Production
3. Total Crude Oil to Refineries
4. Petroleum Refining
5. Gathering and Boosting
   *Data collection began in RY 2016
6. Gas Processing Plant
   *May contain NGL Fractionation equipment
7. Natural Gas Liquids (NGL) Supply

Natural Gas Transmission & Storage

8. Transmission Compressor Stations
9. Underground Storage
10. Liquified Natural Gas (LNG) Storage
11. LNG Import-Export Equipment
12. Natural Gas Transmission Pipeline
    *Data collection began in RY 2016

Distribution

13. Large End Users
14. Natural Gas Distribution
15. Natural Gas & Petroleum Supply to Small End Users

- Subpart W: Emissions from petroleum & natural gas systems
- Subpart Y: Emissions from petroleum refineries
- Subpart MM: CO_2 associated with supplies of petroleum products
- Subpart NN: CO_2 associated with supplies of natural gas & natural gas liquids
- Not reported under GHGRP

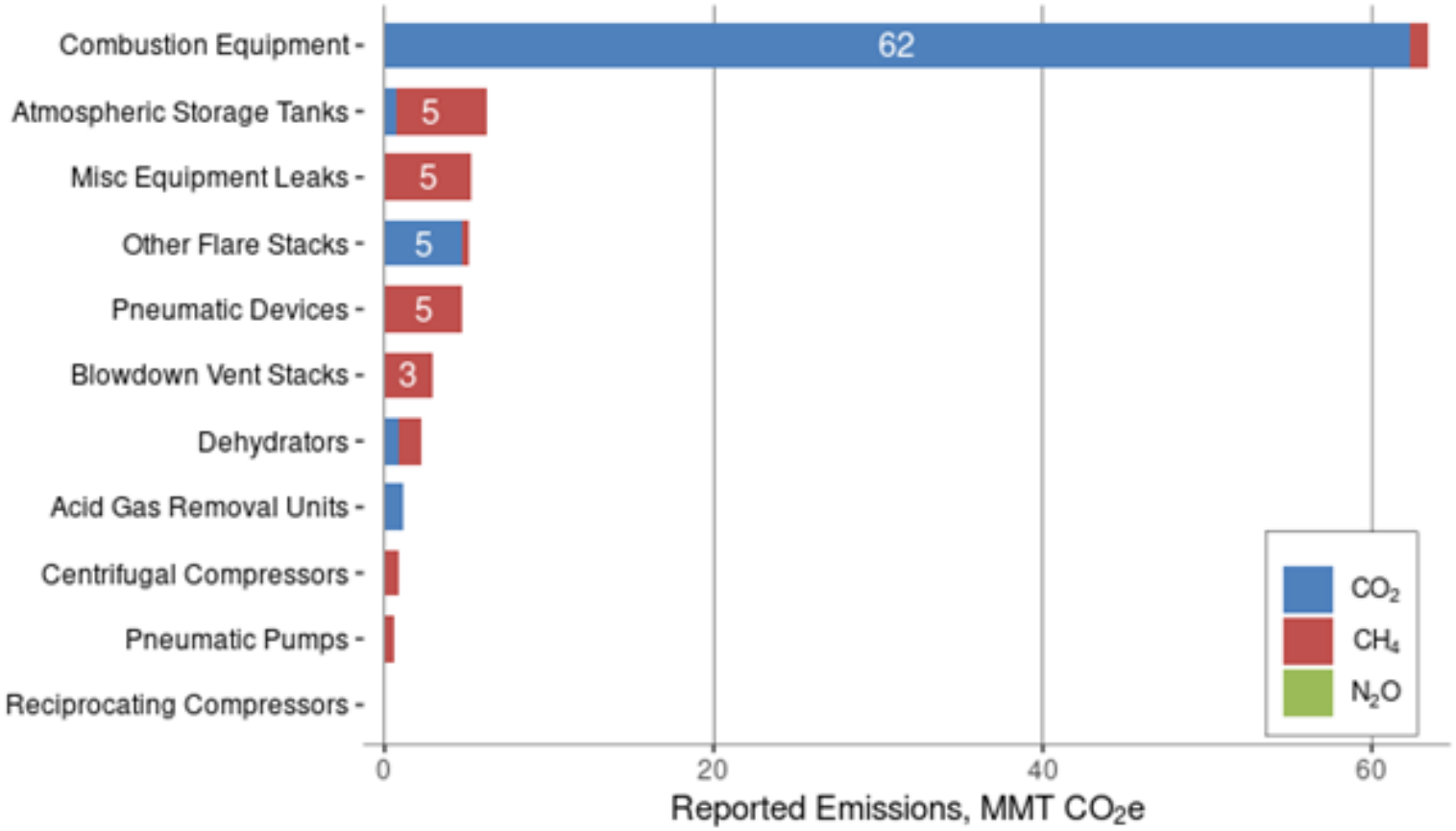
GHGRP 2019: Reported GHG Emissions by Industry Segment

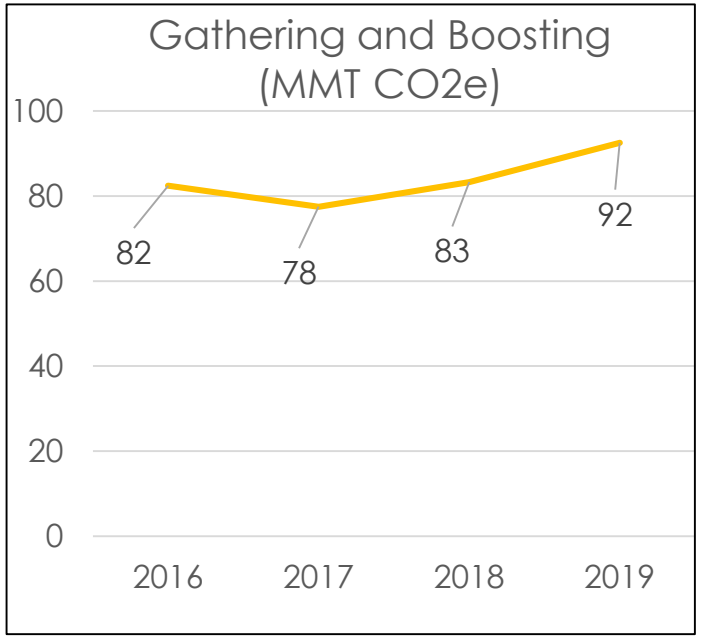
Segment	Number of Facilities	2019 Reported Emissions (Million Metric Tons CO_2e)
Onshore Production	478	117
Offshore Production	141	7
Gathering and Boosting	354	92
Natural Gas Processing	454	58
Natural Gas Transmission Compression	619	31
Natural Gas Transmission Pipeline	43	3
Underground Natural Gas Storage	49	2
LNG Import/Export	11	10
LNG Storage	5	<1
Natural Gas Distribution	163	13
Other Oil and Gas Combustion	56	8
Total	**2,350**	**341**

GHGRP data as of 9/26/2020

GHGRP 2019 Reported Emissions: Gathering and Boosting

2019 Gathering and Boosting: Top Reported Emission Sources





% Change 2018-19

11.0%

% Change 2011-19

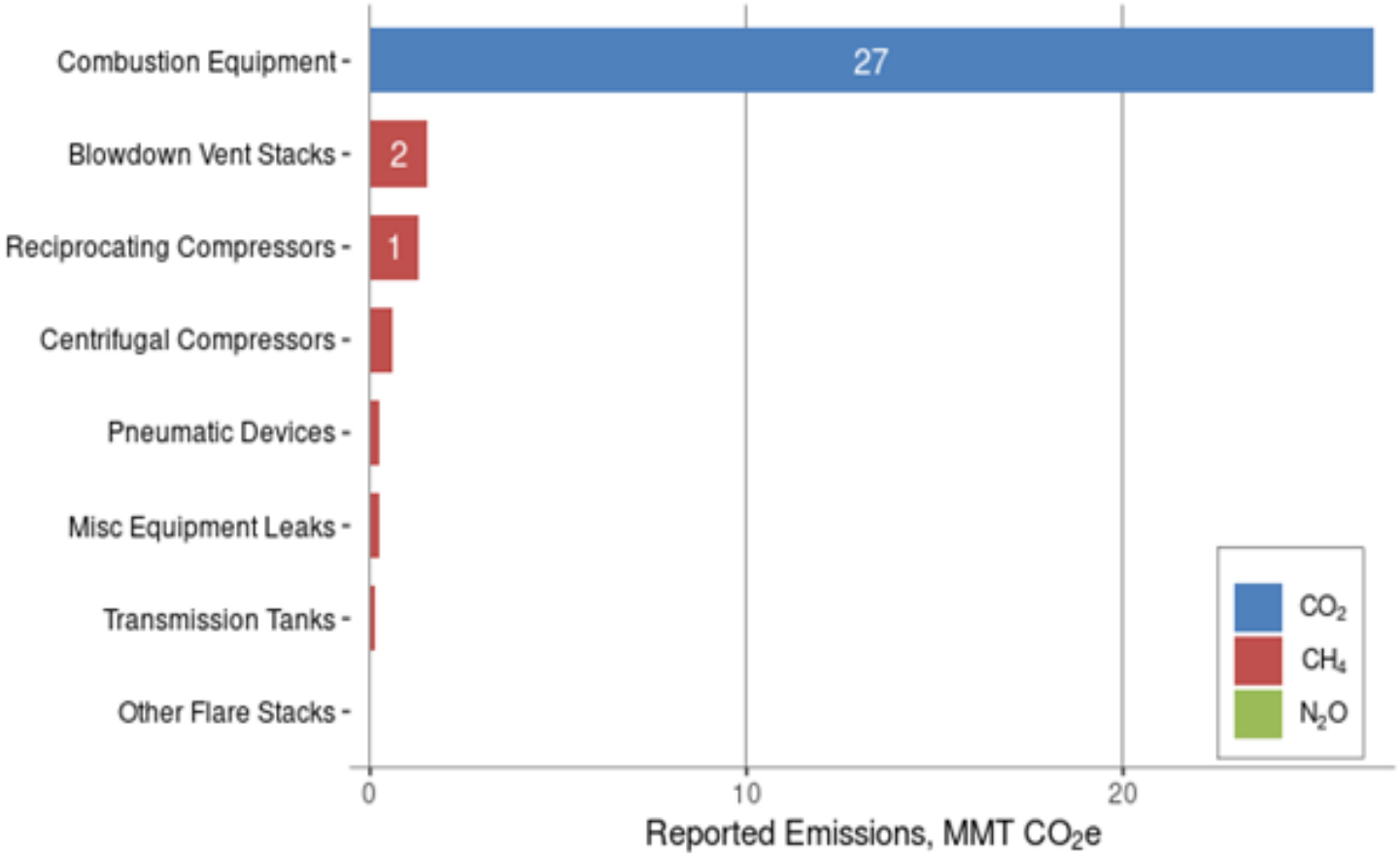
N/A*

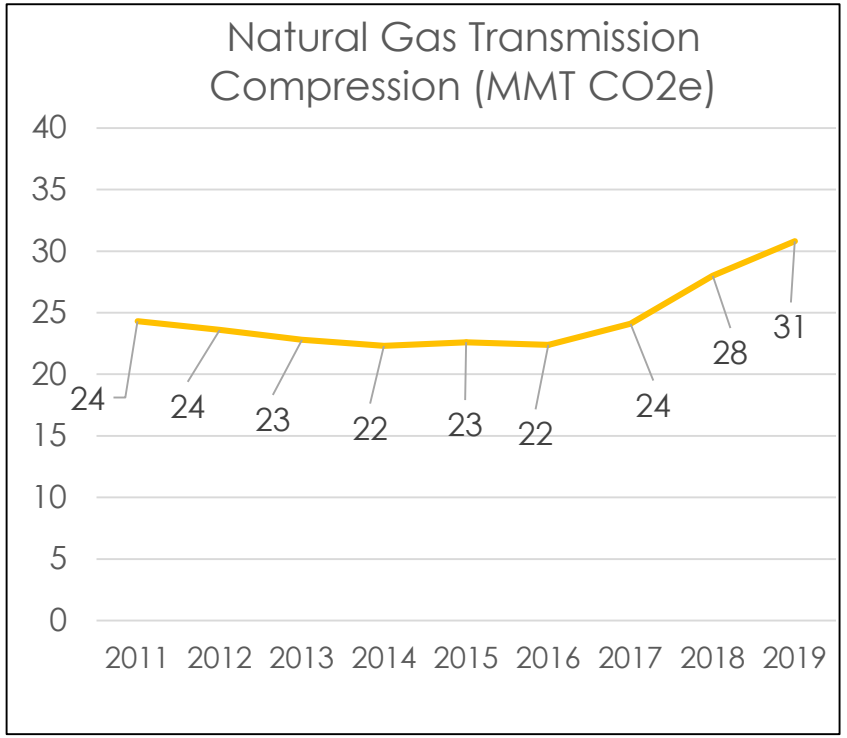
** Gathering and Boosting industry segment began reporting in 2016.*

GHGRP data as of 9/26/2020

GHGRP 2019 Reported Emissions: Natural Gas Transmission Compression

2019 Natural Gas Transmission Compression: Top Reported Emission Sources





% Change 2018-19

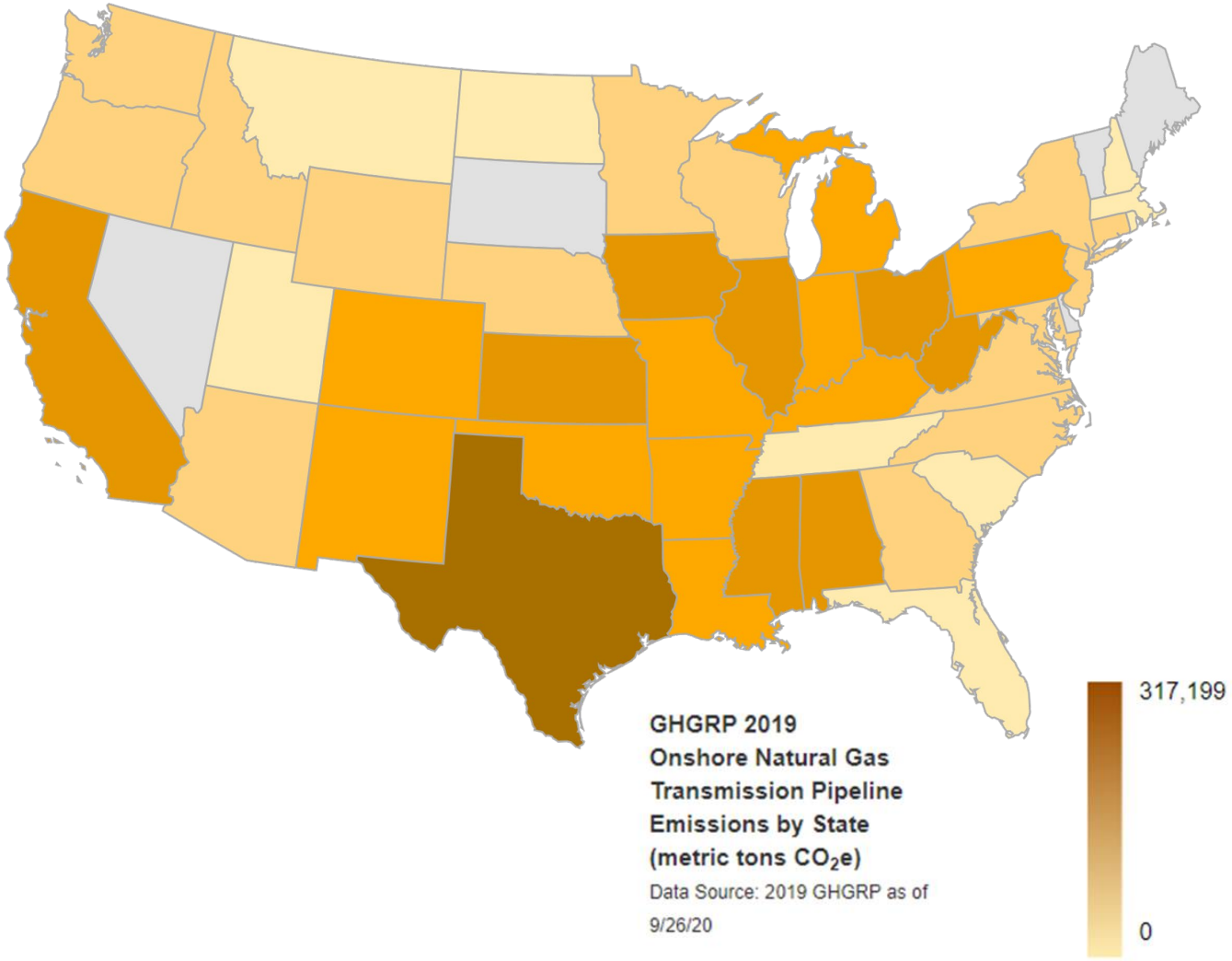
9.8%

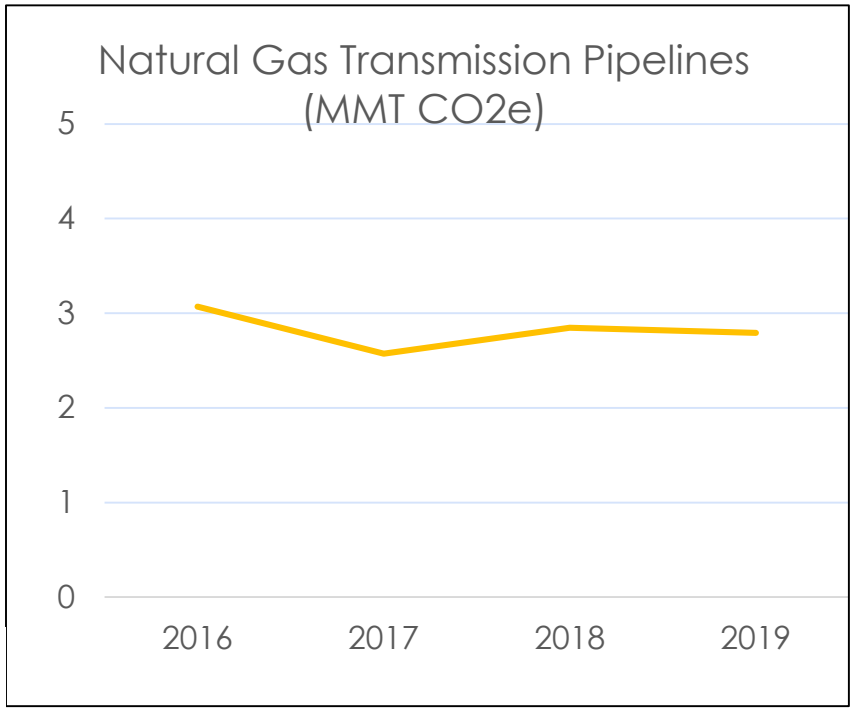
% Change 2011-19

26.8%

GHGRP data as of 9/26/2020

GHGRP 2019 Reported Emissions: Natural Gas Transmission Pipelines





% Change 2018-19

-1.9%

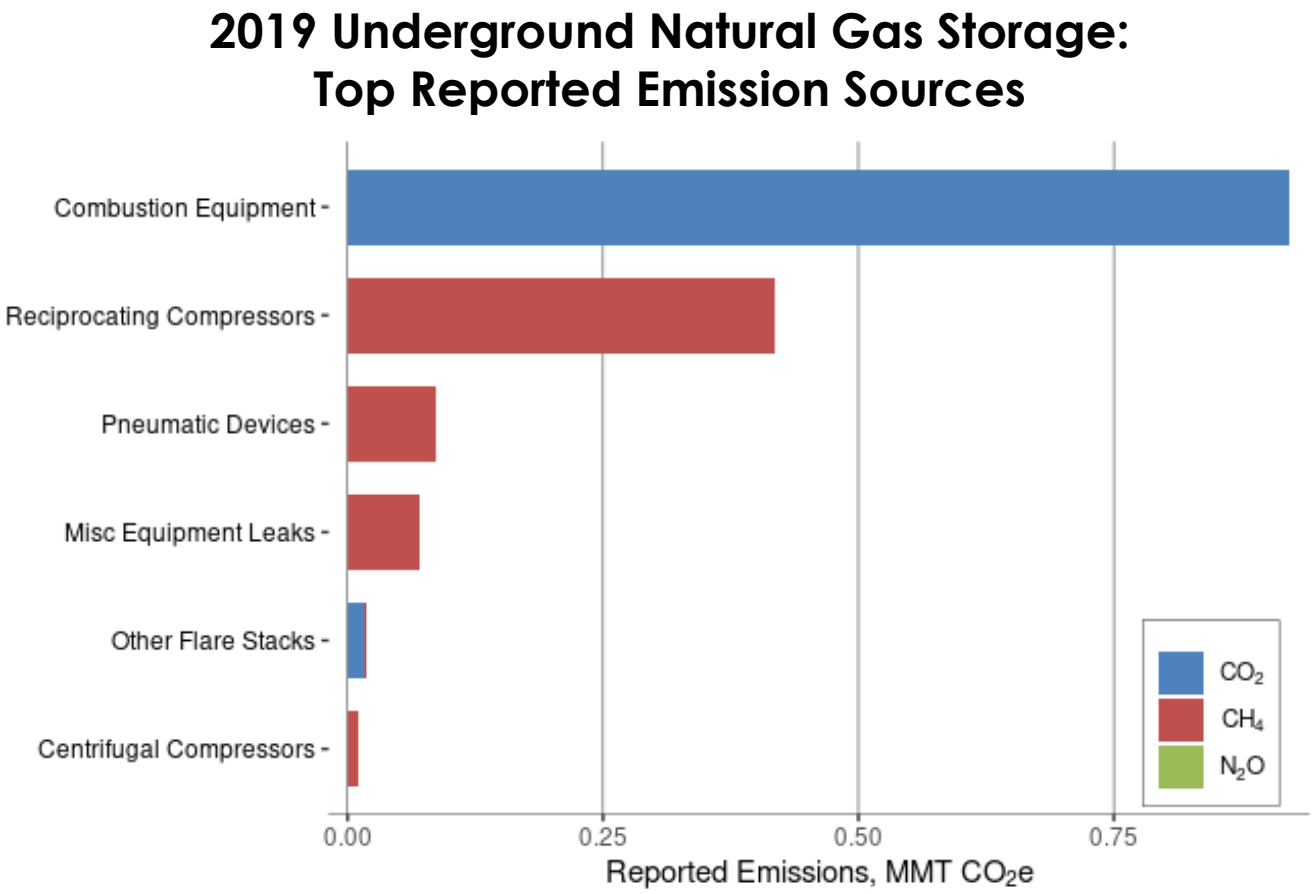
% Change 2011-19

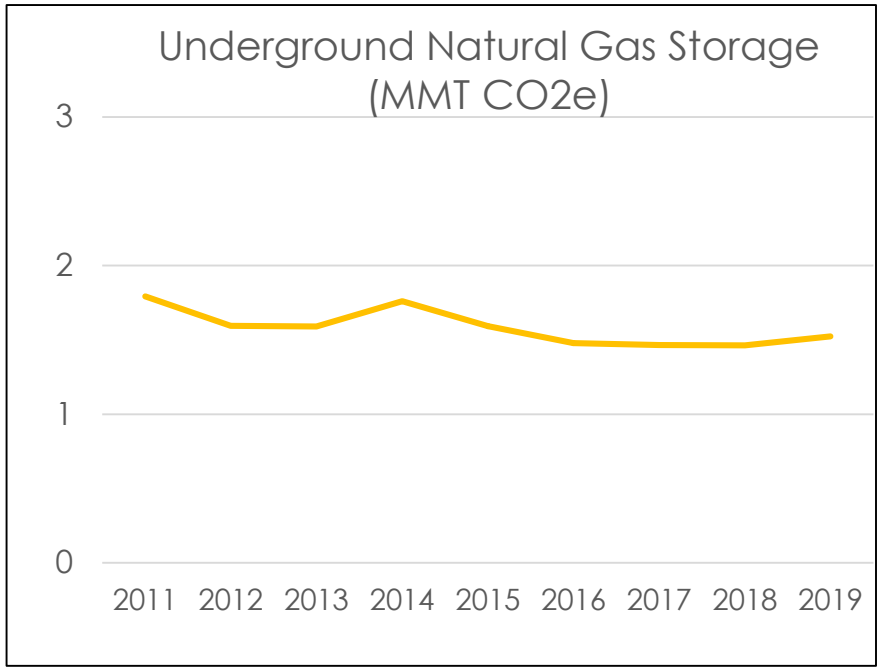
N/A*

** Natural Gas Transmission Pipelines industry segment began reporting in 2016.*

GHGRP data as of 9/26/2020

GHGRP 2019 Reported Emissions: Underground Natural Gas Storage





% Change 2018-19

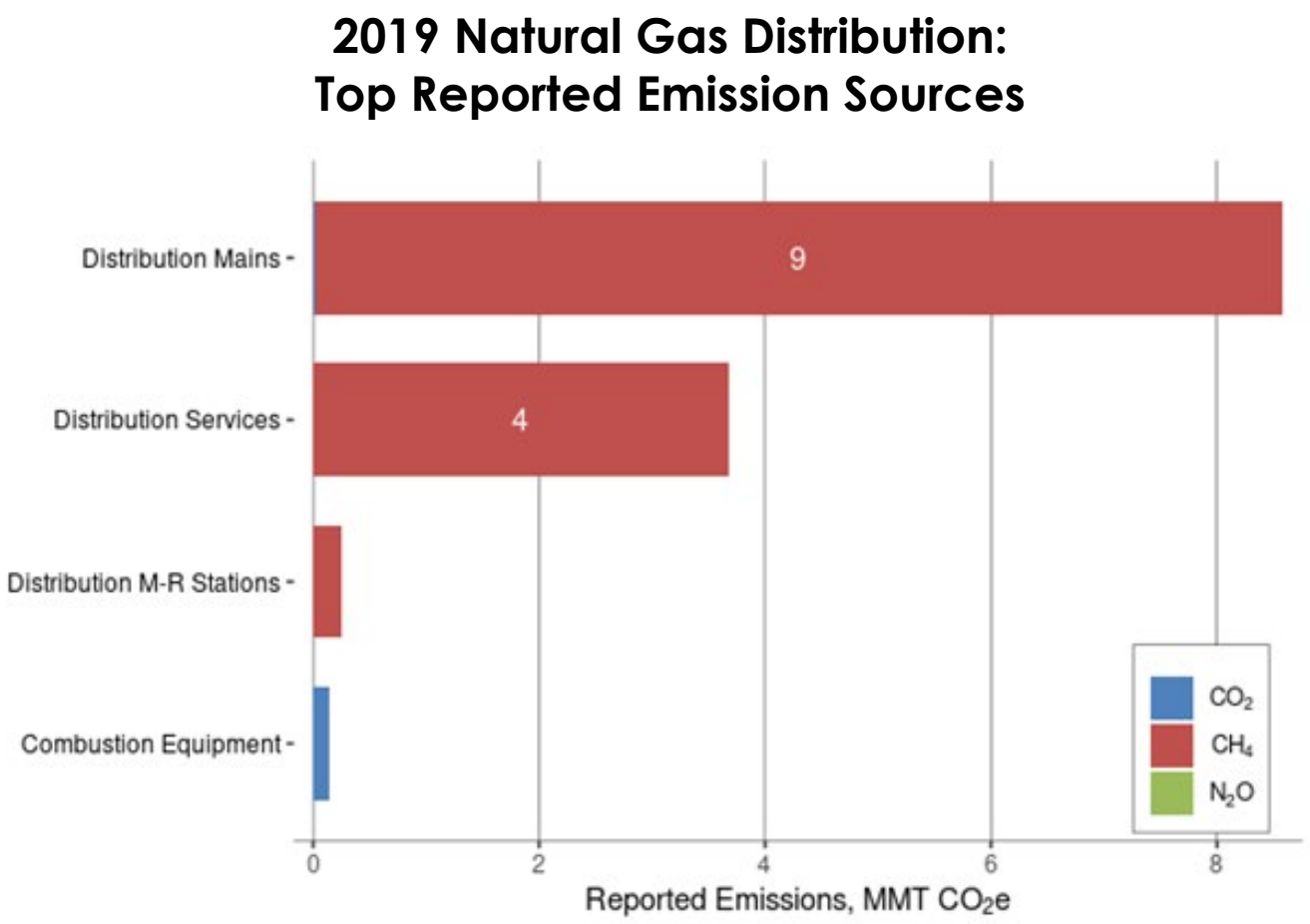
4.2%

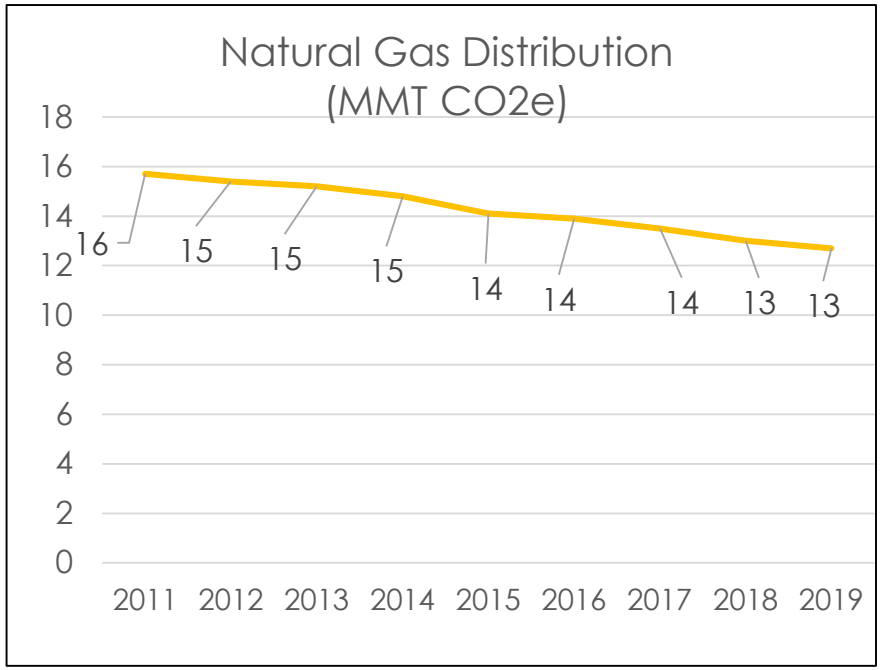
% Change 2011-19

-15.0%

GHGRP data as of 9/26/2020

GHGRP 2019 Reported Emissions: Natural Gas Distribution





% Change 2018-19

-2.7%

% Change 2011-19

-19.1%

GHGRP data as of 9/26/2020

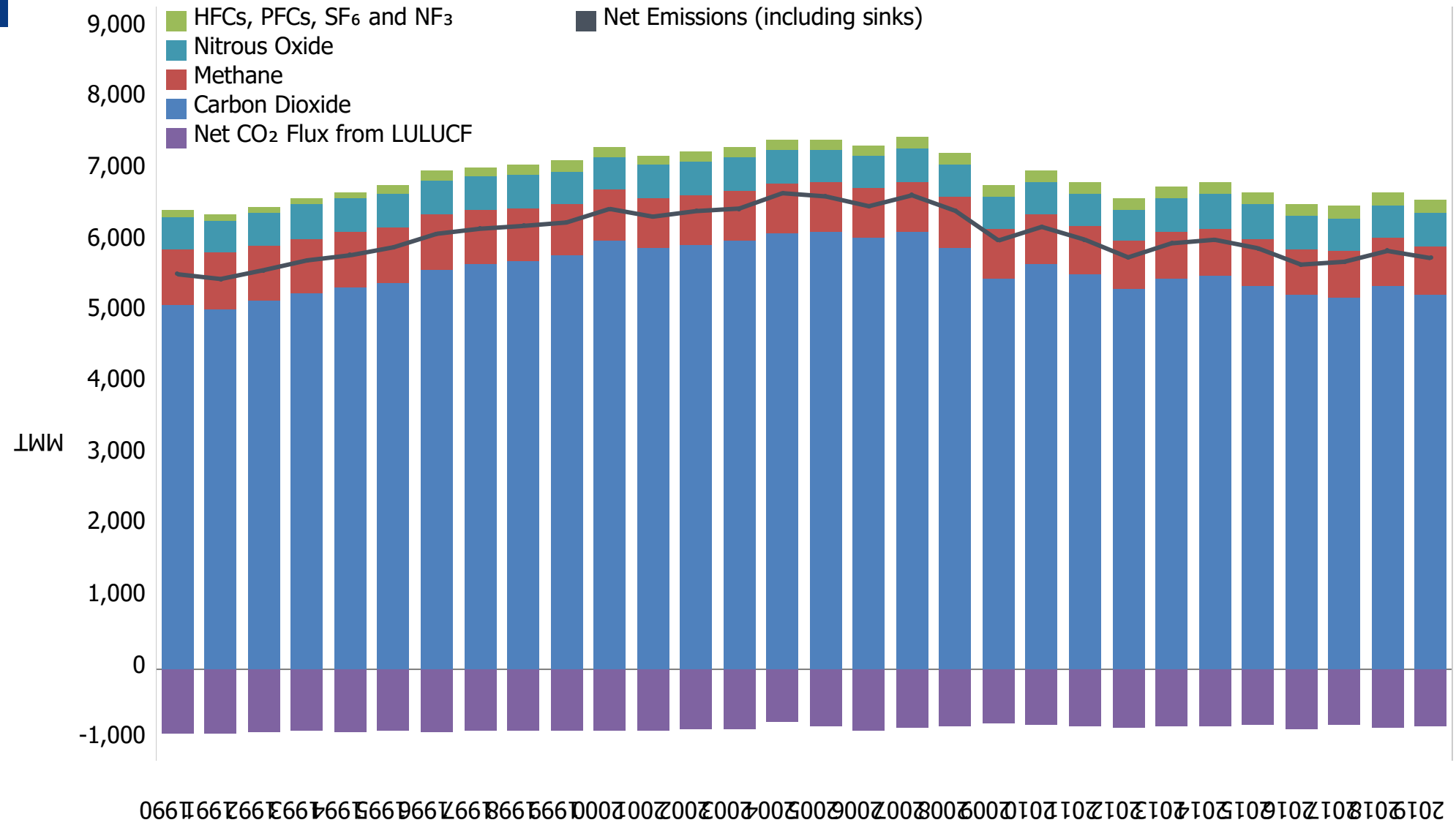
How to Access GHGRP Data on Petroleum and Natural Gas Systems

- GHGRP website: https://www.epa.gov/ghgreporting
- EPA's easy-to-use Facility Level Information on GreenHouse gas Tool (FLIGHT) allows users to view GHG data in a variety of ways
  - View GHG data reported by individual facilities
  - Aggregate reported emissions based on industry segment or geographic level
  - Search for facilities by name, location, corporate parent, or NAICS code
  - Visit FLIGHT: https://ghgdata.epa.gov
- Detailed non-confidential data is available in Envirofacts
  - Access GHG data in Envirofacts: https://www.epa.gov/enviro/greenhouse-gas-customized-search
- GHGRP Help Desk email address: GHGReporting@epa.gov

U.S. GHG Inventory Overview

- **EPA annually compiles a national U.S. GHG Inventory Report**
  - Official U.S. Government data on national GHG emissions and sinks over time by gas, source/sink and economic sector
  - All GHGs: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3
  - Policy-neutral
  - Fulfills U.S. reporting commitment under the UNFCCC
  - Started reporting in 1993
- **Interagency effort led by EPA's Office of Atmospheric Programs (OAP)**
  - Involves other USG agencies (e.g., DoE/EIA, USDA/USFS, USGS, DOT data) academic and research institutions, and industry associations

Trends in U.S. GHG emissions by gas 1990-2019



Calculating Oil and Gas Emissions in the GHGI

- Calculated with an IPCC tier 2/3 approach
- Inventory covers leaks, vents, and flares, and is stratified into natural gas and petroleum pathways of the industry
  - Natural gas - offshore production, onshore production, gas processing, gas transmission, underground gas storage, LNG storage, LNG import and export terminals, and gas distribution
  - Petroleum – offshore production, onshore production, oil transportation, and refineries
- Oil and gas in inventory covers hundreds of types of sources
- General approach is to multiply national activity data by emission factors, e.g.:
  - Miles cast iron pipeline x CH_4 per mile cast iron pipeline
  - # residential meters x CH_4 per residential meter

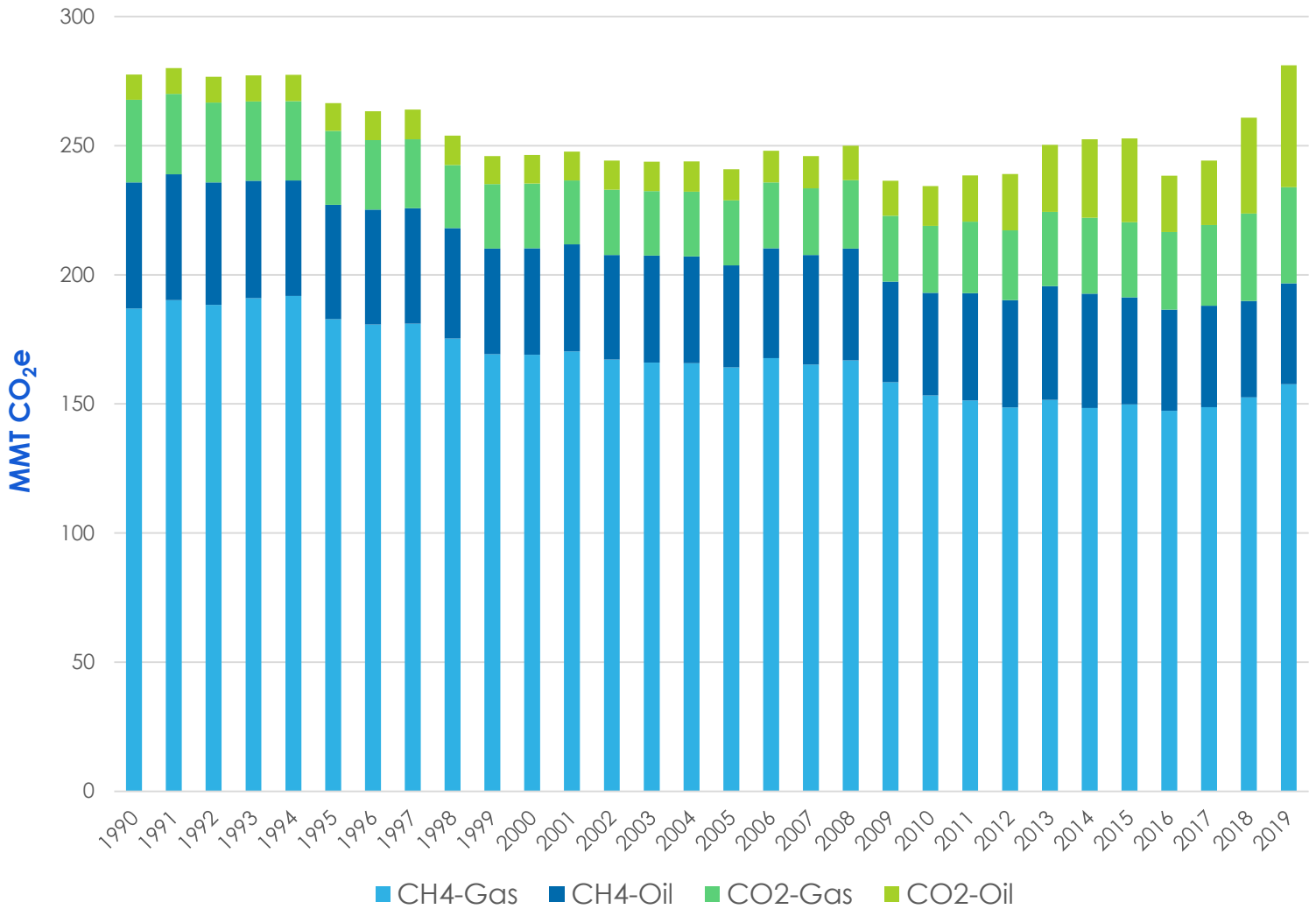
Trends in CH_4 and CO_2 Emissions from Oil and Gas Systems

1990-2019 Trends and Key Drivers

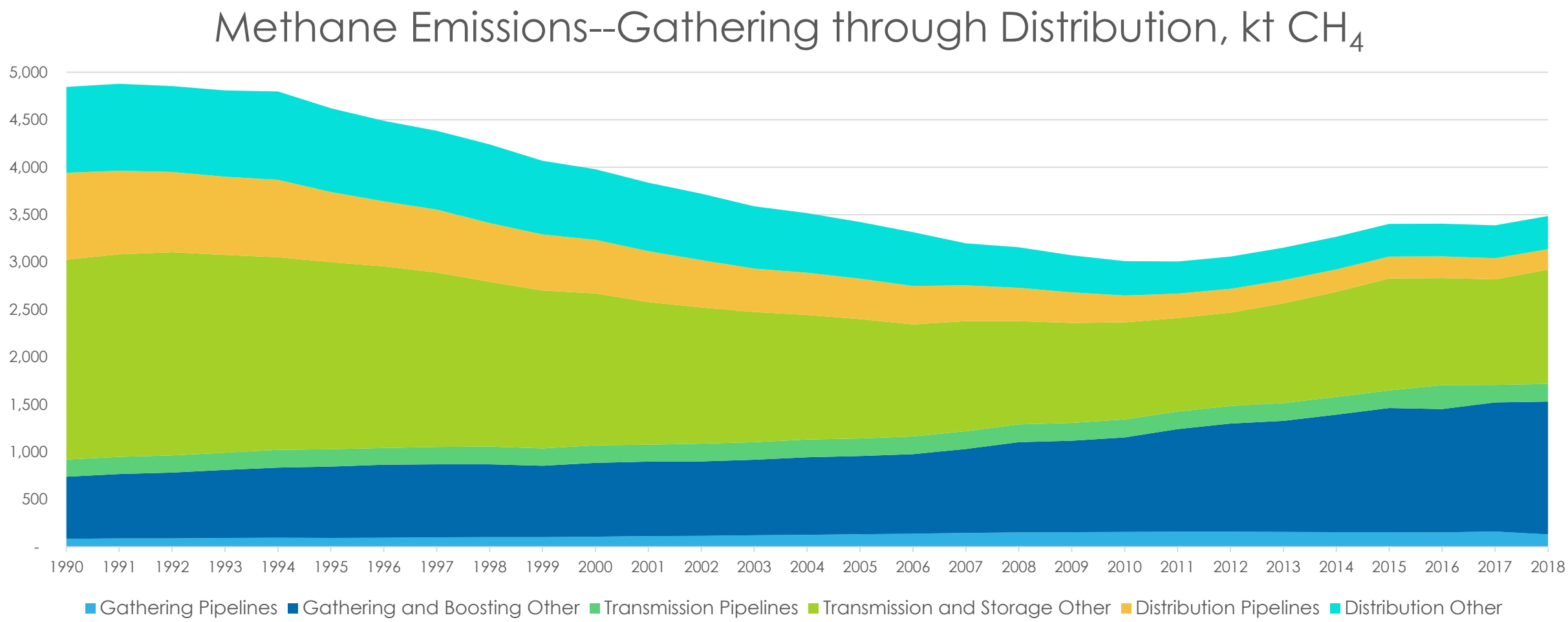
- CH_4-decrease of 17%
  - Distribution (upgrades to pipeline and stations)
  - Transmission and storage (changes in compressor types)
- CO_2-increase of 102%
  - Oil and gas production (increased flaring)

2018-2019 Trends and Key Drivers

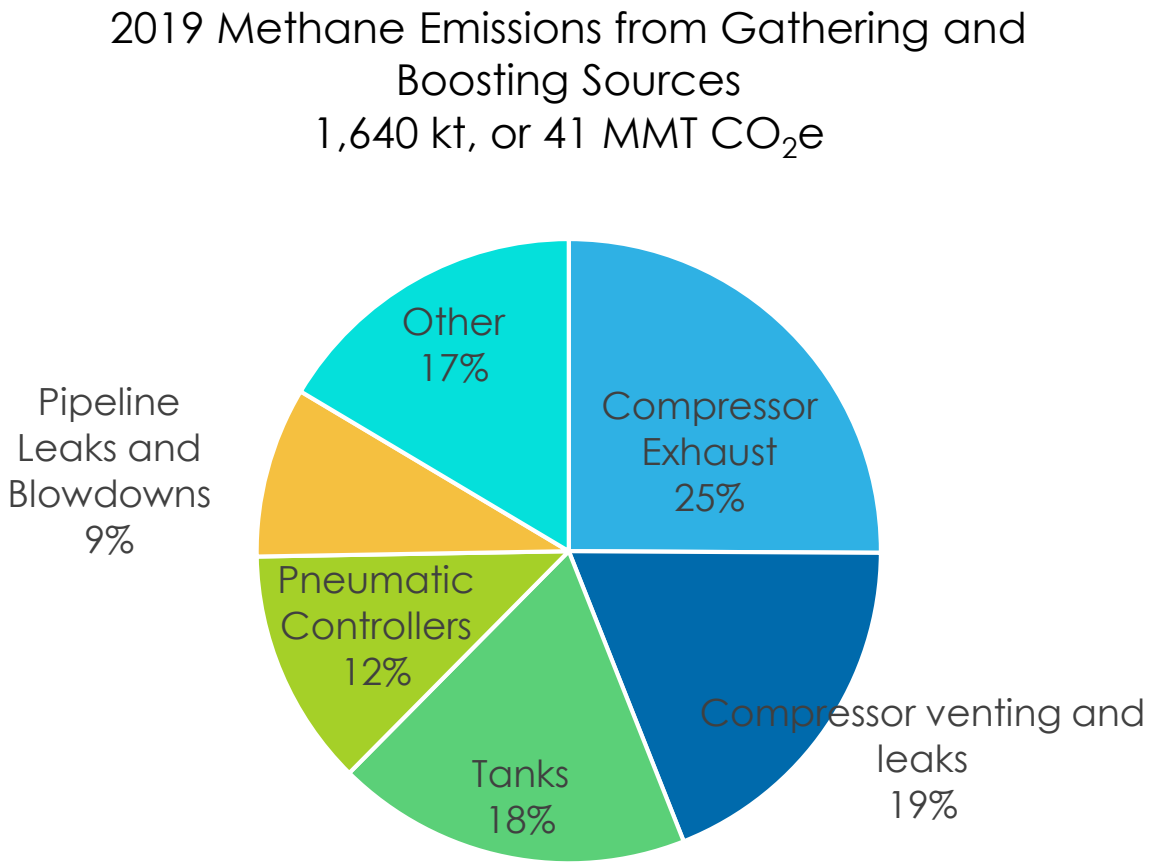
- CH_4-increase of 4%
  - Oil and gas production (increase in emissions from pneumatic controllers)
- CO_2-increase of 19%
  - Oil production (increased flaring of associated gas)



Gathering and Boosting, Transmission and Storage, and Distribution Methane

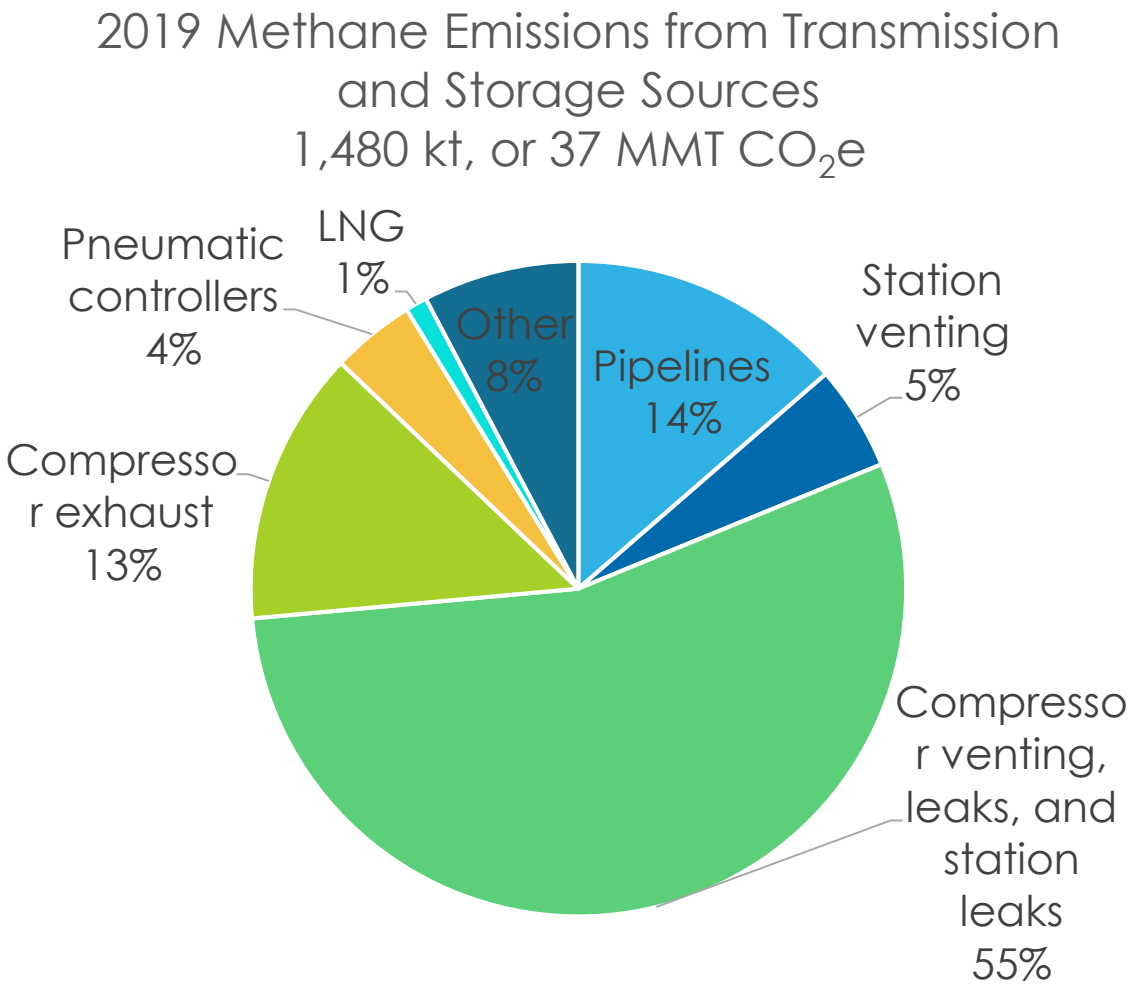


Gathering and Boosting



- Gathering and Boosting Segment is 21% of O&G CH4
- Gathering and Boosting segment emissions have increased by 121% from 1990 and increased by 42% from 2010
- Largest increases in compressor exhaust, and compressor venting and leaks

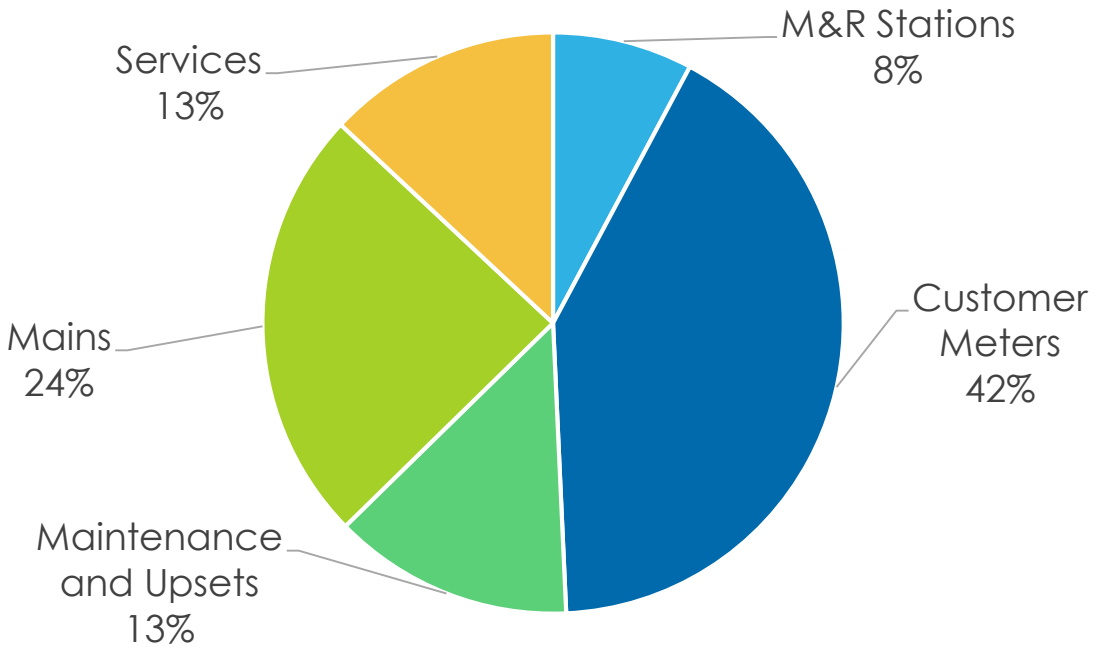
Transmission and Storage



- Transmission and Storage Segment is 19% of O&G CH4
- Transmission and Storage segment emissions have decreased by 35% from 1990 and increased by 22% from 2010
- Compressor venting, leaks and station leak emissions largest impact on trends

Distribution

2019 Methane Emissions from Distribution Sources
560 kt CH_4, or 14 MMT CO_2e



- Distribution Segment is 7% of O&G CH4
- Distribution segment emissions have decreased by 69% from 1990 and by 13% from 2010
- Largest decreases in M&R stations, mains, and services

EPA Oil and Gas Stakeholder Process

- Annual stakeholder process to discuss new data and improvements to GHGI data
- Stakeholder website (https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systems)
  - Information on workshops and memos on updates under consideration
  - Full time series of data and information on methods
- 2021 GHGI Stakeholder Process
  - September and November 2020 Webinars
    - EPA presentations on GHGRP data, updates under consideration for meters, mud degassing, produced water, uncertainty and storage wells
    - Stakeholder presentations on pneumatic controllers, analyses of top-down bottom-up discrepancies, and storage stations
- 2022 GHGI Stakeholder Process will start summer of 2021

Voluntary Programs

The Natural Gas STAR Program began in 1993, providing a framework for EPA to partner with U.S. oil and gas operators and to promote voluntary methane reducing technologies and practices

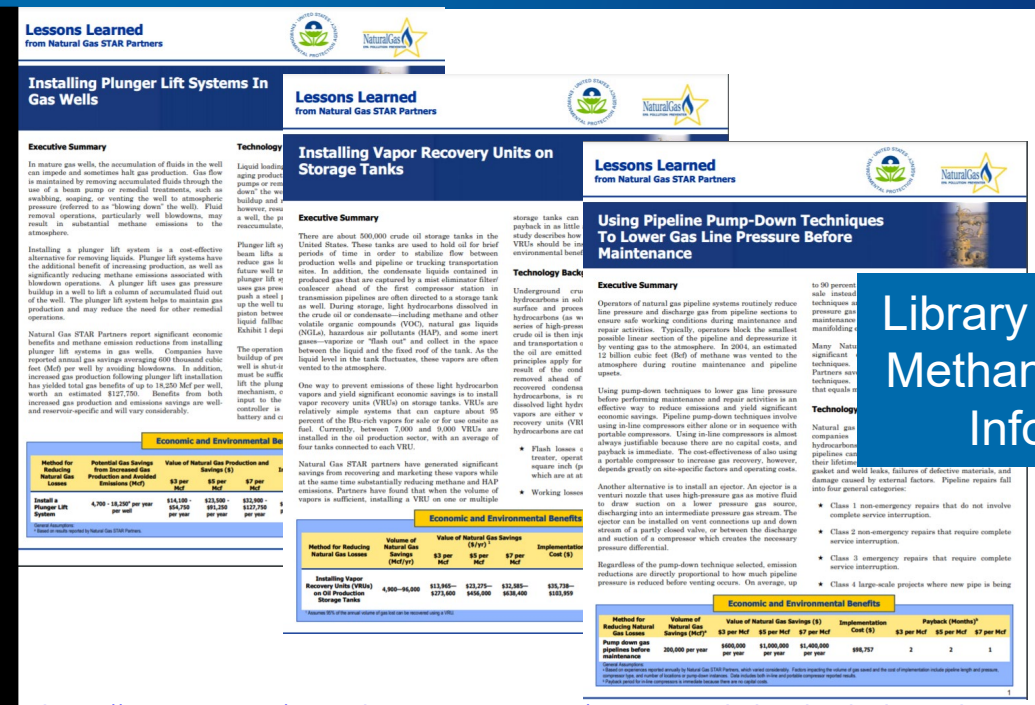
The Methane Challenge Program launched in 2016, building on Natural Gas STAR and providing a mechanism for companies to make more rigorous, and transparent, commitments to voluntarily reduce methane

Voluntary Program Accomplishments and Resources

25 2019 **MMTCO$_2$e Reductions**

812 Total **MMTCO$_2$e Reductions**

122 **Partners**



Library of Technical Methane Mitigation Information

https://www.epa.gov/natural-gas-star-program/recommended-technologies-reduce-methane-emissions

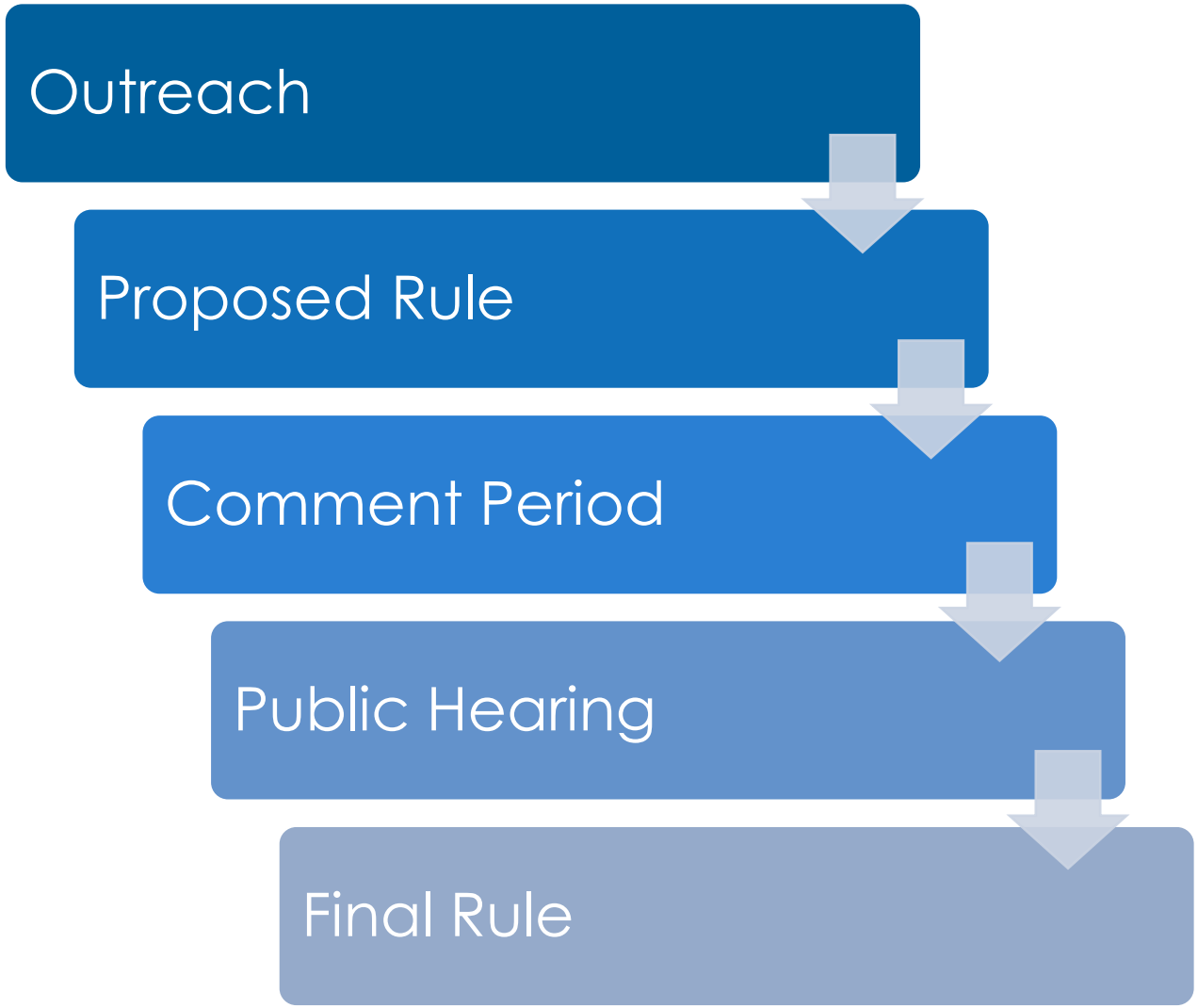
Dozens of Workshops and Conferences with Industry

https://www.epa.gov/natural-gas-star-program/outreach-and-events

Regulatory Status

- On January 20, 2021, President Biden issued Executive Order (EO) 13990 **"Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis."**
- The EO instructs EPA to consider taking two actions by September 2021 focused on reducing methane from the oil and gas sector:
  - Proposing a rule to reduce methane emissions in the oil and gas sector by **suspending, revising, or rescinding previously issued standards** known as **new source performance standards**.
  - Proposing **new regulations** to reduce methane and VOC emissions from **existing operations** in the oil and gas sector, including the exploration and production, processing, transmission, and storage segments.

Regulatory Status



- EPA is working to complete the review directed by EO 13990
- EPA will **engage broadly** with stakeholders to develop a proposal that achieves **ambitious** and **cost-effective** reductions in climate- and health-harming pollution, and encourages continued development of **innovative technologies**