Greenhouse Gas Reporting Program
Petroleum and Natural Gas Systems

U.S. Environmental Protection Agency
October 17, 2018

Agenda

- Background on Greenhouse Gas Reporting Program (GHGRP)
- GHGRP Petroleum and Natural Gas Systems (Subpart W): Reporting Year 2017 Data Summary

Background on Greenhouse Gas Reporting Program

Overview of GHG Reporting Program

- Launched in response to FY 2008 Consolidated Appropriations Act
- Annual reporting of GHGs by 41 source categories
  - 33 types of direct emitters
  - 6 types of suppliers of fuel and industrial GHGs
  - Facilities that inject CO_2 underground for geologic sequestration, enhanced oil recovery, or any other purpose
- Most source categories began collecting data in 2010
  - An additional 12 source categories began collecting data in 2011
  - We now have 8 years of data for 29 source categories and 7 years of data for 12 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

Source Categories Covered by GHG Reporting Program

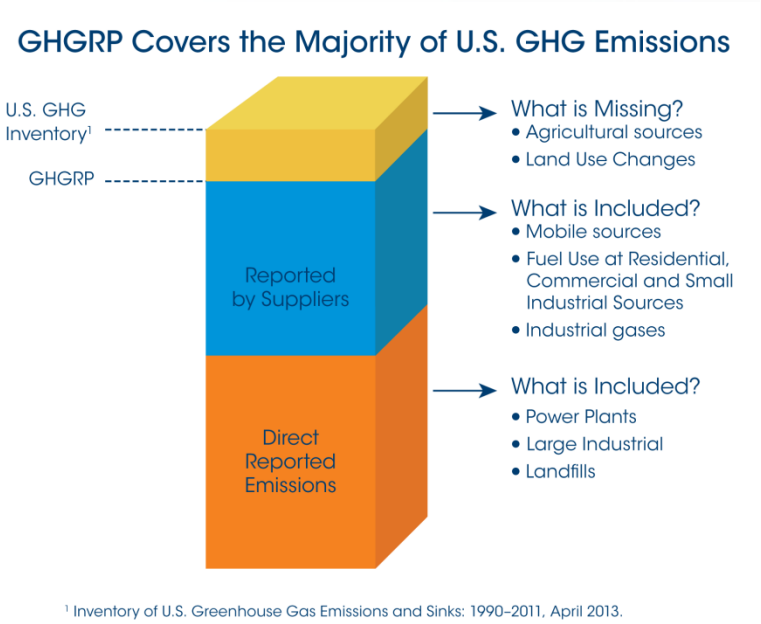
Power	Refining & Petrochem	Other Chemicals	Combustion	Waste	Metals	Minerals	Pulp & Paper	High GWP Gases
- Electricity Generation - Electrical Equipment Mfg. - Electrical Equipment Use	- Petroleum Refineries - Petrochem. Production	- Adipic Acid - Ammonia - Hydrogen Production - Nitric Acid - Phosphoric Acid - Titanium Dioxide	- Stationary Combustion	- Industrial Waste Landfills - Industrial Wastewater Treatment - MSW Landfills	- Aluminum - Ferroalloy - Iron & Steel - Lead - Magnesium - Silicon Carbide - Zinc	- Cement - Glass - Lime - Misc. Carbonate Use - Soda Ash	- Pulp & Paper	- Electronics Mfg. - Fluorinated GHG Production - HCFC-22 Prod./HFC-23 Destruction - Pre-Charged Equipment Import/Export - Industrial Gas Suppliers

Petroleum & Natural Gas Systems	Fuel Suppliers	Carbon Capture & Sequestration	Mining
- Onshore Production - Offshore Production - Gathering and Boosting (as of 2016) - Natural Gas Processing - Natural Gas Transmission Compression - Natural Gas Transmission Pipeline (as of 2016) - Natural Gas Distribution - Underground Natural Gas Storage - Liquefied Natural Gas Storage - Liquefied Natural Gas Import/Export	- Coal-Based Liquid Fuels Suppliers - Natural Gas and Natural Gas Liquids Suppliers - Petroleum Product Suppliers	- Geologic Sequestration of CO_2 - Injection of CO_2 - CO_2 Suppliers	- Underground Coal Mines

Direct Emitters
Suppliers
CO_2 Injection

GHG Reporting Program vs. US GHG Inventory

- Inventory of U.S. Greenhouse Gas Emissions and Sinks (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
  - GHGRP covers most, but not all, U.S. GHG emissions
  - GHGRP does not include agriculture, land use, and small sources



[1] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2011, April 2013.

Task	Inventory	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		✓

Electronic Reporting Workflow

EPA GHG Data System

e-GGRT Electronic Greenhouse Gas Reporting Tool

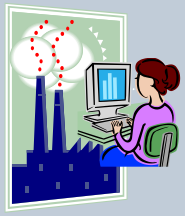
Improve data quality *before* it is submitted to EPA
- Intuitive Interface
- Comprehensive Help
- Real-Time Data Quality Feedback

EPA EnviroFacts: Serviceable, searchable and separately hosted copy of non-CBI dataset.

State-Specific Service Oriented data flow using EnviroFacts API

Downloadable XLS, XML & HTML Data Files & highlights

Data Verification (EPA)



Reporters
Facilities and Suppliers

e-GGRT Electronic Greenhouse Gas Reporting Tool

e-GGRT, interactive web-based, data reporting tool

EPA

e-GGRT Datamart

GHGRP Data Publication Website (FLIGHT)
(ghgdata.epa.gov)

Data Collection

Data Publication

Validation and Verification

EPA's verification process includes thousands of electronic checks.

These checks comprise two groups. **Validation** checks and **Verification** checks.

Validation generally refers to electronic checks and messaging performed by e-GGRT and presented to the reporter before the annual GHG report is certified and submitted

Verification refers to electronic checks, manual review, and messaging performed by EPA after the annual report is certified and submitted.

What is a Facility?

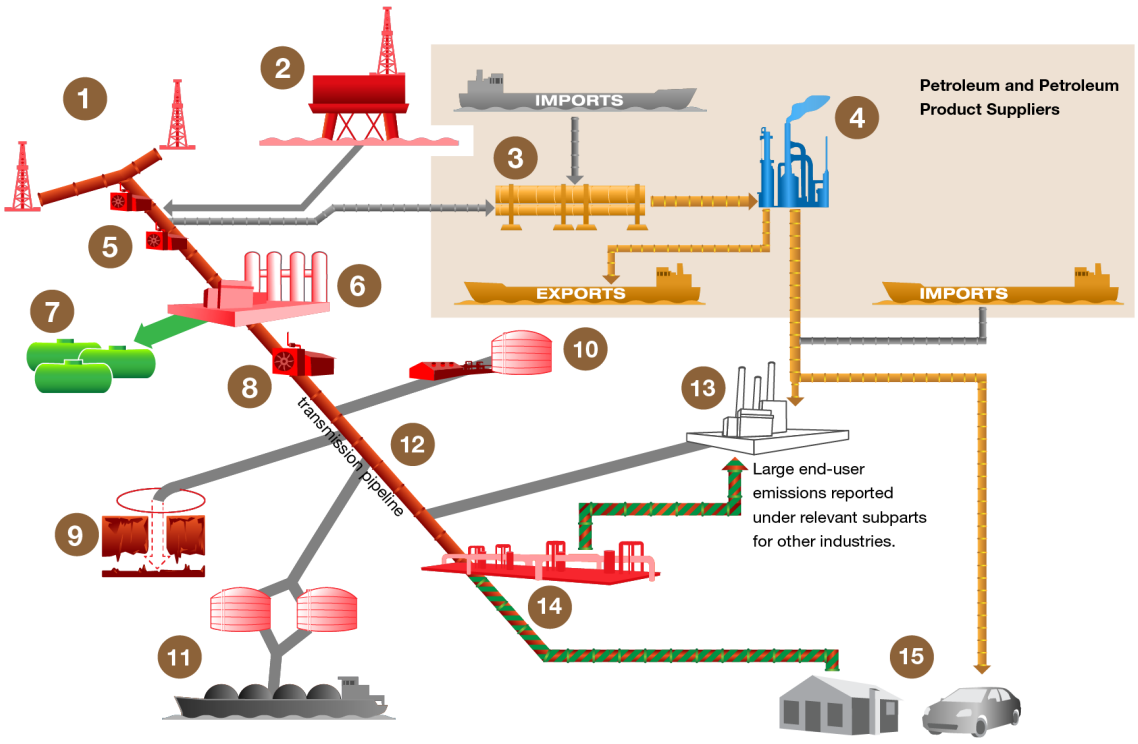
- In general, a “facility” for purposes of the GHGRP means all co-located emission sources that are commonly owned or operated
- However, certain industry segments within the Petroleum and Natural Gas Systems source category have unique “facility” definitions
  - Onshore production: the “facility” includes all emissions associated with wells owned or operated by a single company (the permit holder) in a specific hydrocarbon producing basin (as defined by the geologic provinces published by the American Association of Petroleum Geologists)
  - Natural gas distribution: the “facility” is a local distribution company as regulated by a single state public utility commission
  - Gathering and boosting: a “facility” 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
  - Natural gas transmission pipeline, a “facility” means the total U.S. mileage of natural gas transmission pipelines, owned and operated by an onshore natural gas transmission pipeline owner or operator
- The other industry segments in the Petroleum and Natural Gas Systems source category follow the general GHGRP definition of “facility”

GHGRP Petroleum and Natural Gas Systems: Reporting Year 2017 Data Summary

Reporting Year 2017 Data Release

- Today, EPA is releasing 2017 data collected by the GHG Reporting Program.
- In 2017, reported emissions were down 2.7% from 2016.
  - Reported emissions from large power plants declined 4.5% since 2016, and 19.7% since 2011.
  - Reported emissions from petroleum and natural gas systems increased 1.5% since 2016.
  - Reported emissions from other large sources in the industrial and wastes sectors were mostly unchanged from 2016.

GHGRP and the Oil and Gas Industry



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

Reported GHG Emissions by Industry Segment

- EPA received annual reports from 2,253 facilities
- Reported emissions totaled 284 Million Metric Tons (MMT) CO_2e
- Largest segments in terms of reported GHG emissions were onshore production, gathering and boosting, and natural gas processing

Segment	Number of Facilities	2017 Reported Emissions (Million Metric Tons CO_2e)
Onshore Production	497	94
Offshore Production	141	7
Gathering and Boosting	321	75
Natural Gas Processing	449	56
Natural Gas Transmission Compression	529	24
Natural Gas Transmission Pipeline	33	3
Underground Natural Gas Storage	48	1
LNG Import/Export	6	4
LNG Storage	6	<1
Natural Gas Distribution	169	13
Other Oil and Gas Combustion	79	7
Total	2,253	284

GHGRP data as of 8/19/18

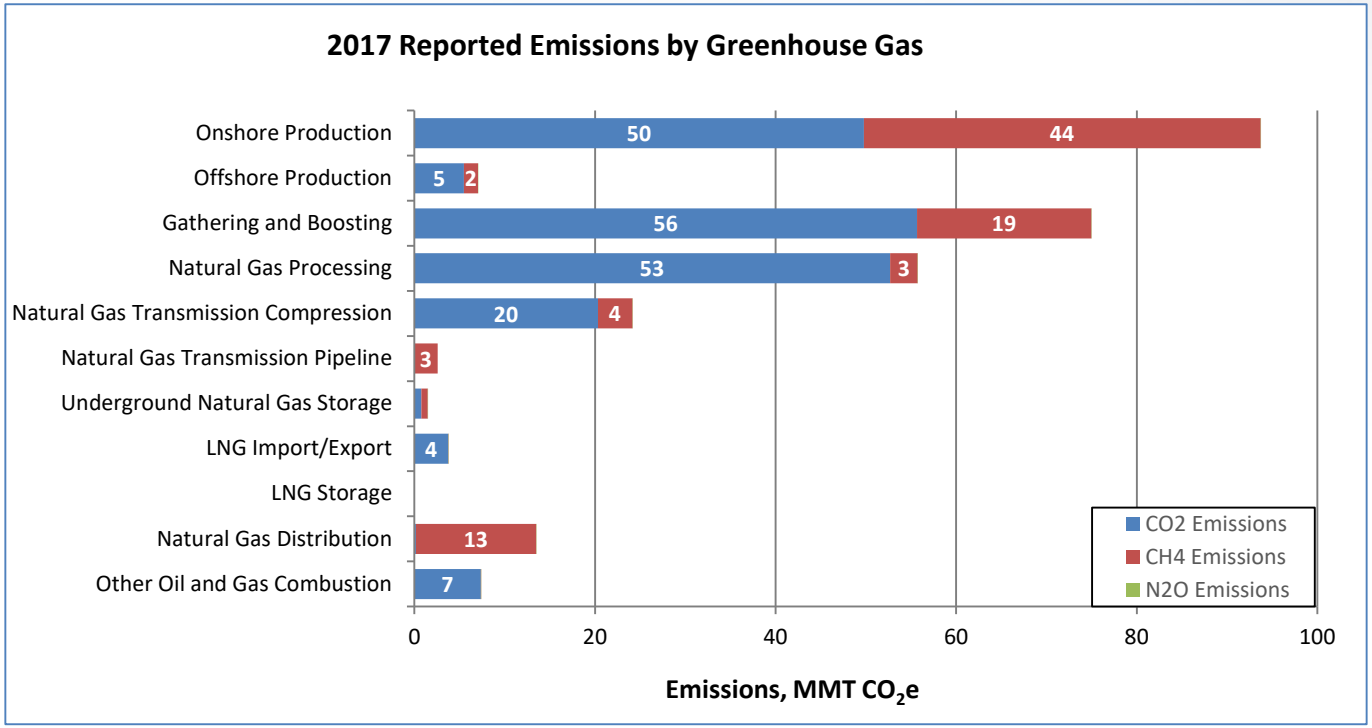
Changes in Reported Emissions by Industry Segment: 2011-2017

Industry Segment	2011 Reported Emissions (MMT CO_2e)	2012 Reported Emissions (MMT CO_2e)	2013 Reported Emissions (MMT CO_2e)	2014 Reported Emissions (MMT CO_2e)	2015 Reported Emissions (MMT CO_2e)	2016 Reported Emissions (MMT CO_2e)	2017 Reported Emissions (MMT CO_2e)
Onshore Production	92	93	98	102	101	85	94
Offshore Production	6	7	6	7	7	7	7
Gathering and Boosting	N/A	N/A	N/A	N/A	N/A	82	75
Natural Gas Processing	59	60	59	60	59	55	56
Natural Gas Transmission Compression	24	24	23	22	23	22	24
Natural Gas Transmission Pipeline	N/A	N/A	N/A	N/A	N/A	3	3
Underground Natural Gas Storage	2	2	2	2	2	1	1
LNG Import/Export	1	1	<1	1	1	2	4
LNG Storage	<1	<1	<1	<1	<1	<1	<1
Natural Gas Distribution	16	15	15	15	14	14	13
Other Oil and Gas Combustion	23	25	24	28	29	7	7
Total	**222**	**226**	**228**	**235**	**235**	**280**	284

GHGRP data as of 8/19/18

Reported Emissions by Greenhouse Gas

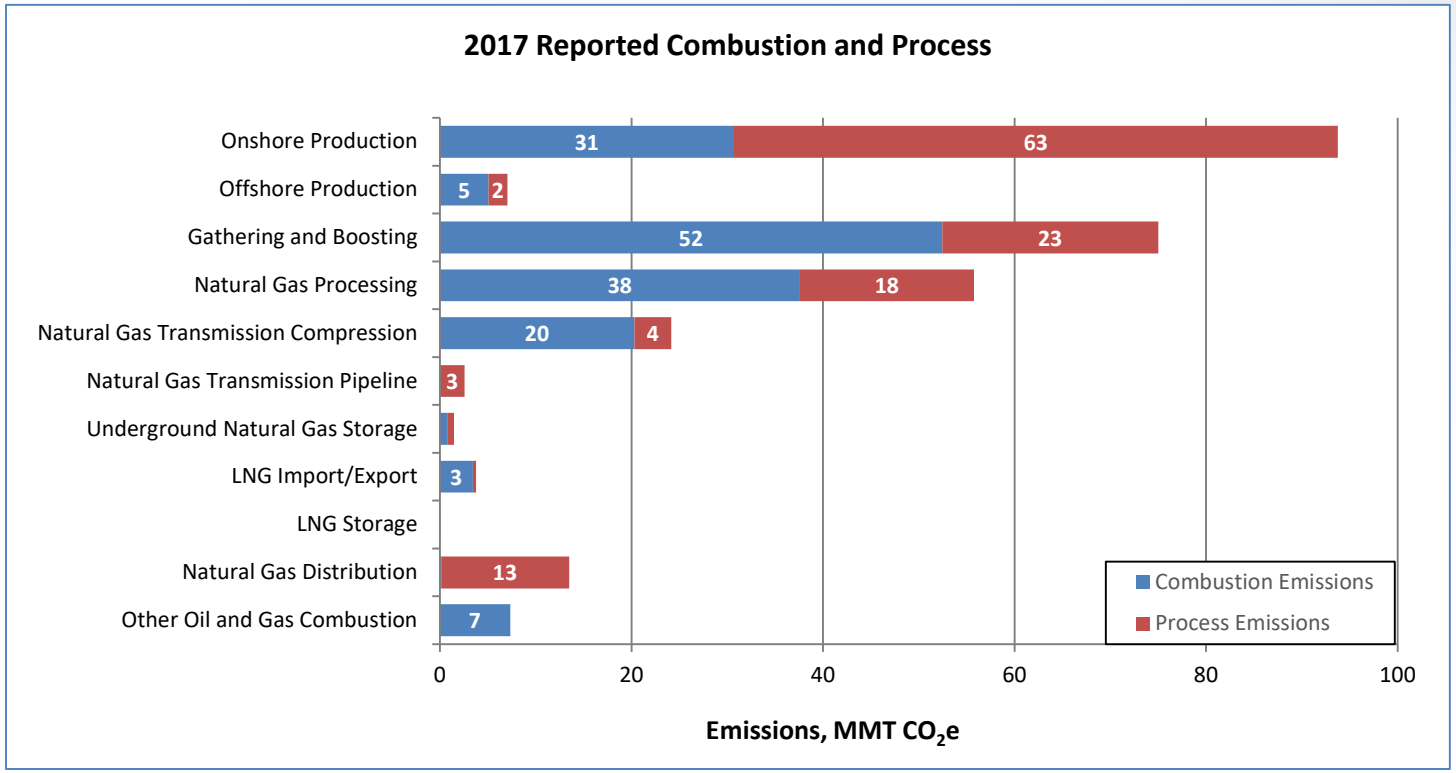
- Carbon dioxide (CO_2) emissions accounted for 197 MMT CO_2e and methane (CH_4) emissions accounted for 88 MMT CO_2e
- Emissions from natural gas distribution were primarily methane while emissions from natural gas transmission compression, natural gas processing, gathering and boosting, and onshore production were primarily carbon dioxide



GHGRP data as of 8/19/18

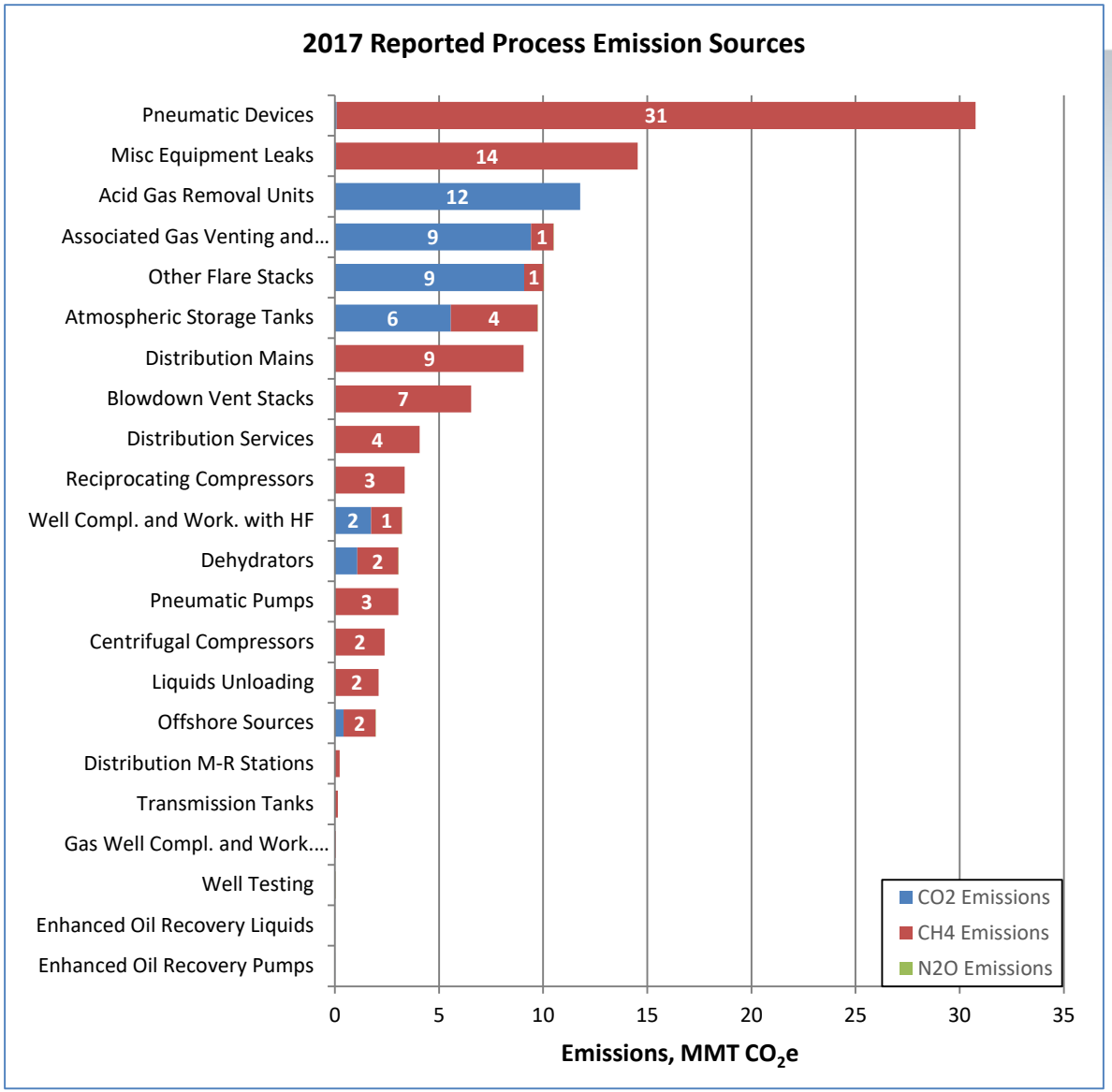
Combustion and Process Emissions

- GHG emissions can result from combustion of fossil fuels, or from process sources that lead to the direct emission of GHGs
- Total combustion emissions were 159 MMT CO_2e and were primarily from gathering and boosting, natural gas processing, onshore production, and natural gas transmission compression
- Total process emissions were 129 MMT CO_2e and were primarily from onshore production, gathering and boosting, natural gas processing, and natural gas distribution



GHGRP data as of 8/19/18

Process Emission Sources

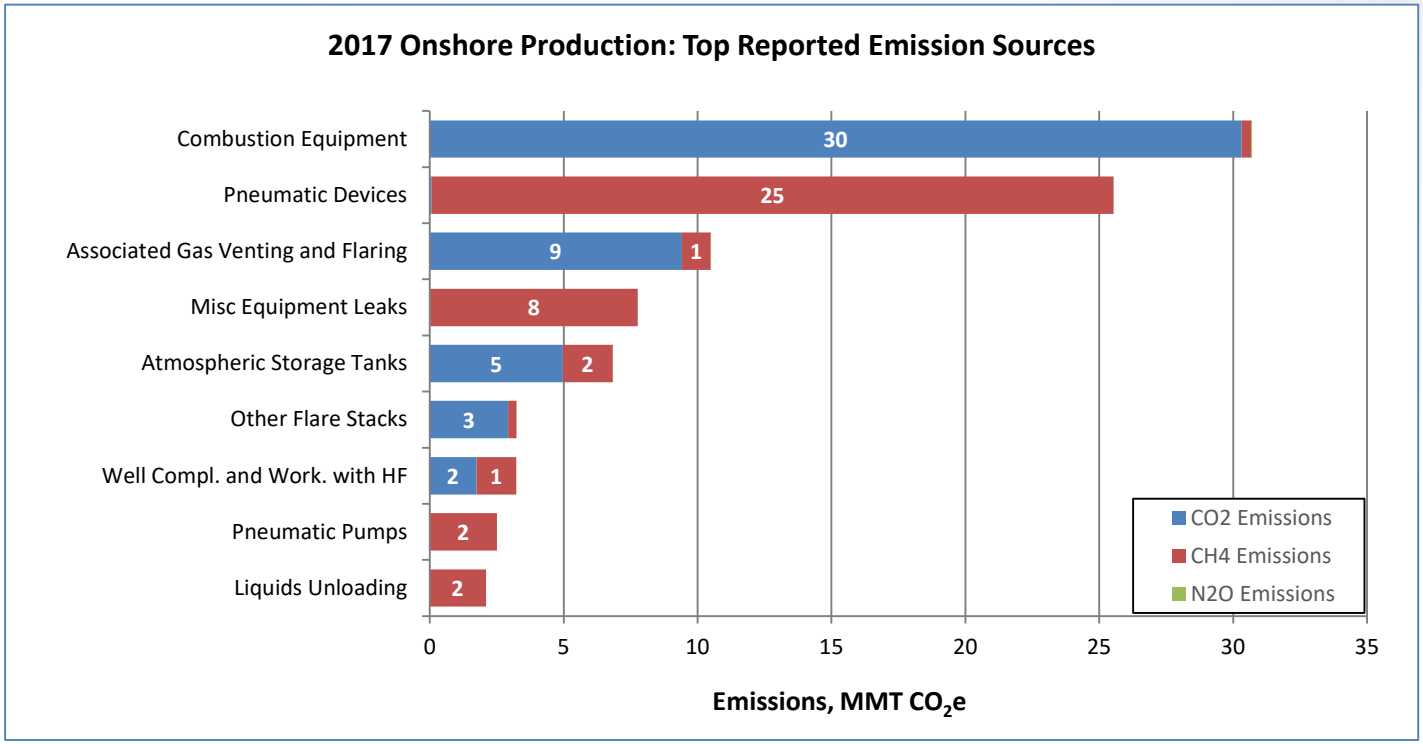


- The figure to the left shows total reported process emissions across all Petroleum and Natural Gas Systems facilities
- The largest reported process emission sources were pneumatic devices, miscellaneous equipment leaks, and acid gas removal units

GHGRP data as of 8/19/18

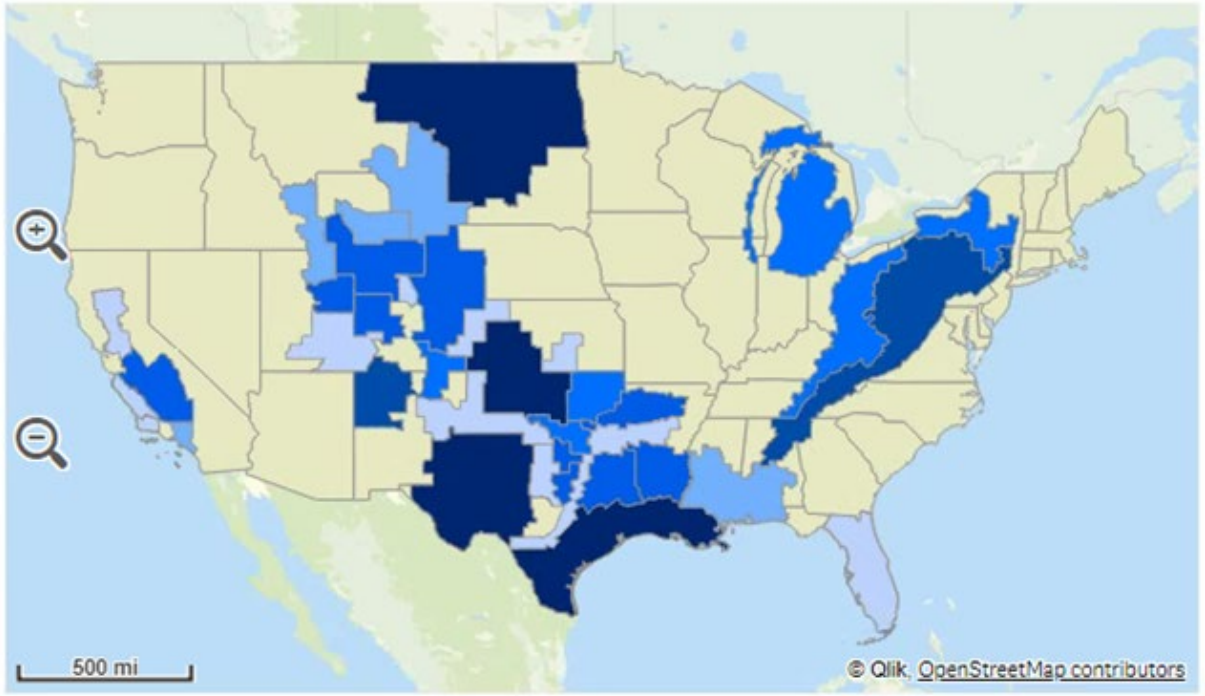
Onshore Production

- Reported emissions in onshore production totaled 93.8 MMT CO_2e
- Methane emissions totaled 44.2 MMT CO_2e and carbon dioxide emissions totaled 50.5 MMT CO_2e
- Combustion equipment (30.9 MMT CO_2e) and pneumatic devices (25.7 MMT CO_2e) were the top reported emission sources in onshore production



GHGRP data as of 8/19/18

Onshore Production Basins

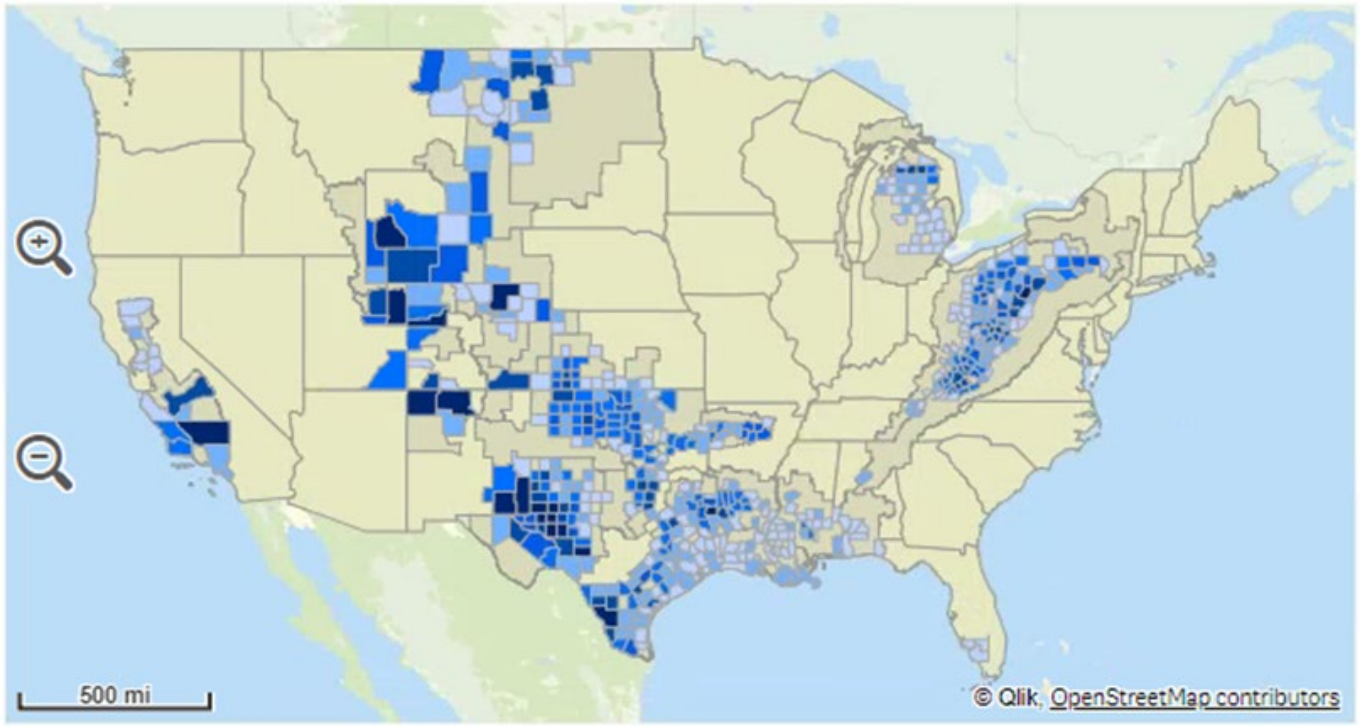


GHGRP, 2017
Emissions by Basin
Onshore Petroleum and Natural Gas Production
(metric tons CO_2e)

Range
1,000 - 150,000
150,000 - 500,000
500,000 - 1,500,000
1,500,000 - 5,000,000
5,000,000 - 10,000,000
10,000,000 - 15,000,000

GHGRP data as of 8/19/18

Onshore Production Well Count by County



GHGRP, 2017
Well Count by County
Onshore Petroleum and Natural Gas Production (wells)

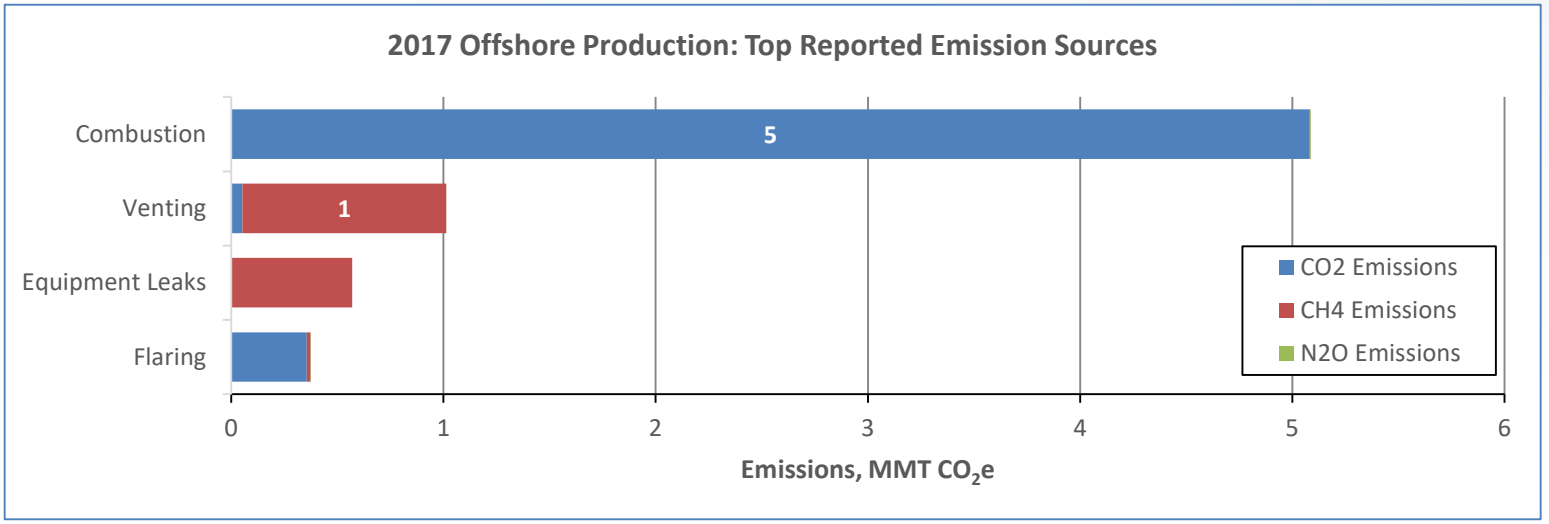
Total from counties in Alaska: 1,449 wells

Range
1 - 50
50 - 200
200 - 500
500 - 1,000
1,000 - 2,000
> 2,000

GHGRP data as of 8/19/18

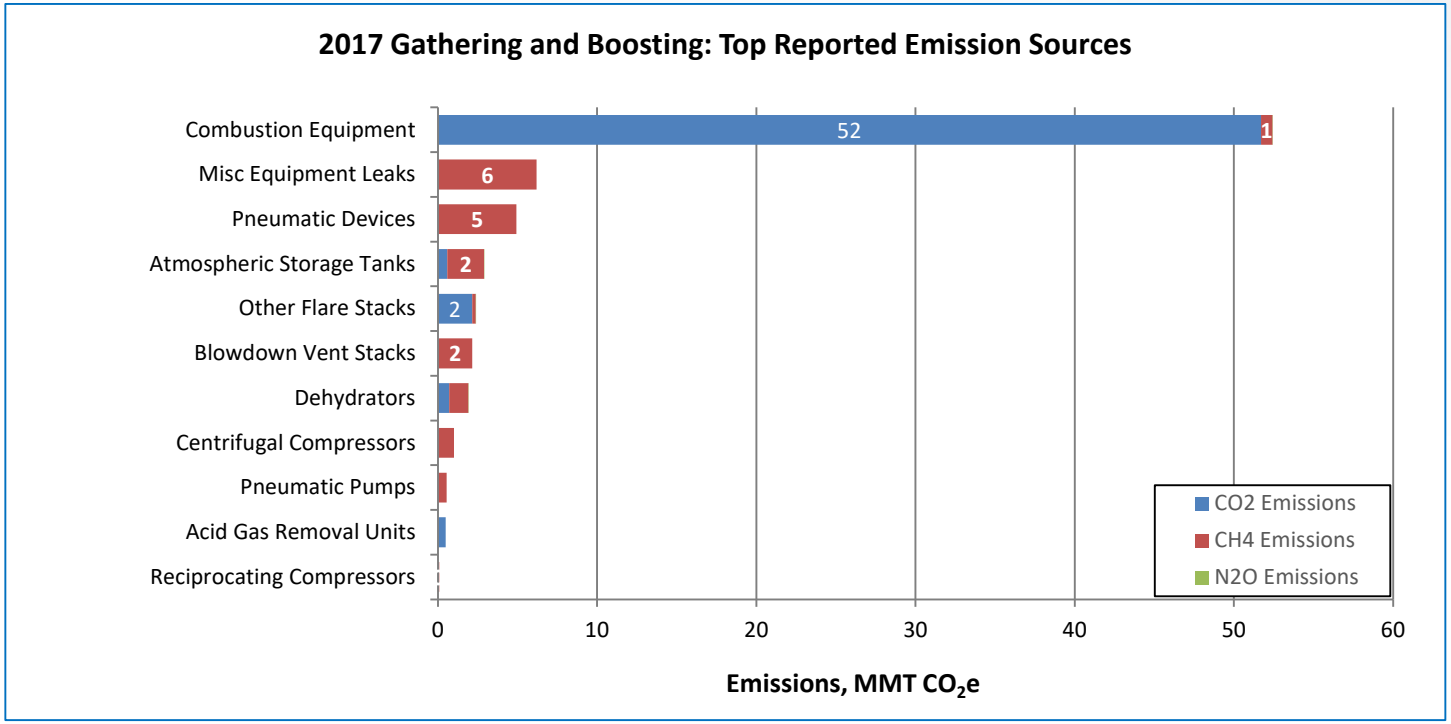
Offshore Production

- Reported emissions from offshore production totaled 7.0 MMT CO_2e
- Methane emissions totaled 1.6 MMT CO_2e and carbon dioxide emissions totaled 5.5 MMT CO_2e
- The top reported emission source was combustion equipment (5 MMT CO_2e)
- GHGRP calculation methods for process emissions are based on requirements that were established by the Bureau of Ocean Energy Management (BOEM)



Gathering and Boosting

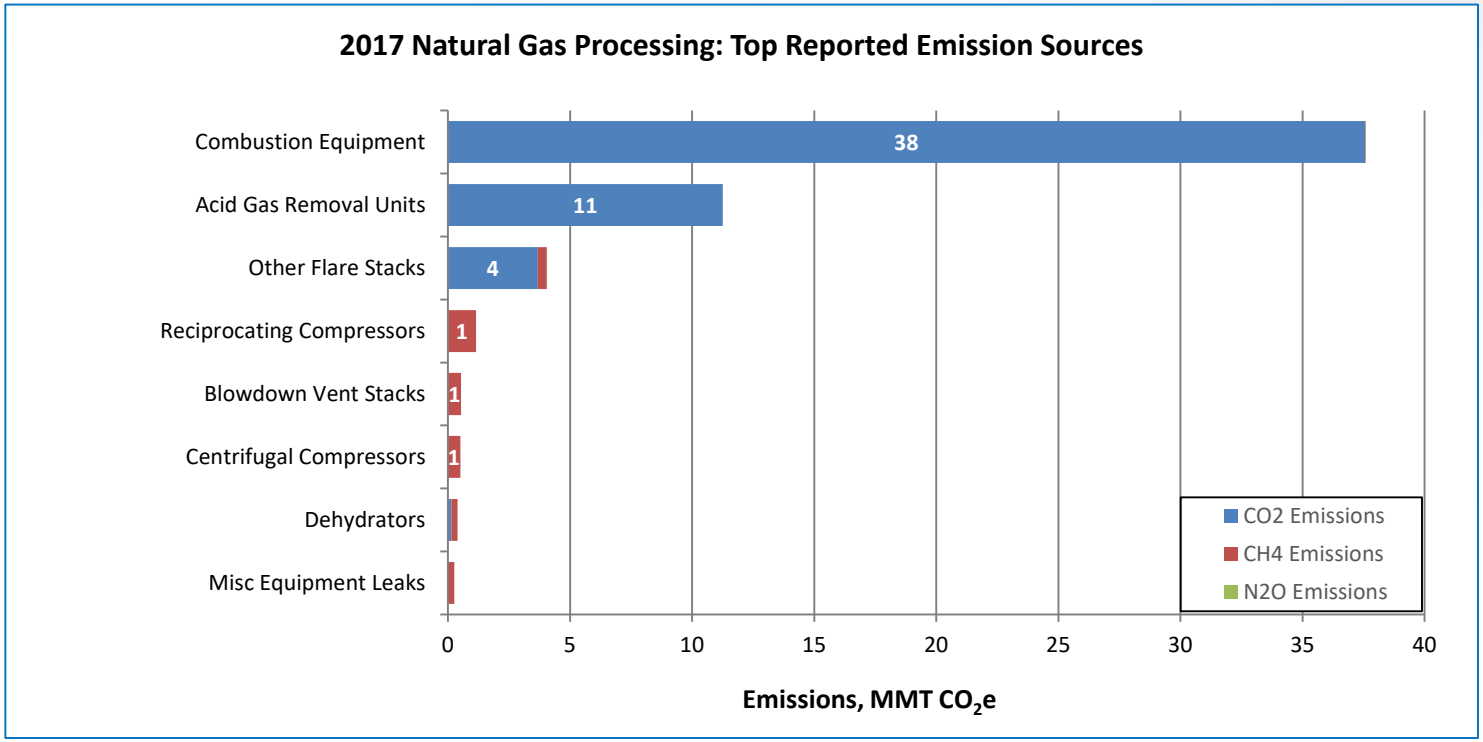
- The gathering and boosting segment was first reported in 2016
- Reported emissions from gathering and boosting totaled 75 MMT CO_2e
- Methane emissions totaled 19.3 MMT CO_2e and carbon dioxide emissions totaled 55.7 MMT CO_2e
- The top reported emission sources were combustion equipment (52.5 MMT CO_2e), miscellaneous equipment leaks (6.2 MMT CO_2e), and pneumatic devices (4.9 MMT CO_2e)



GHGRP data as of 8/19/18

Natural Gas Processing

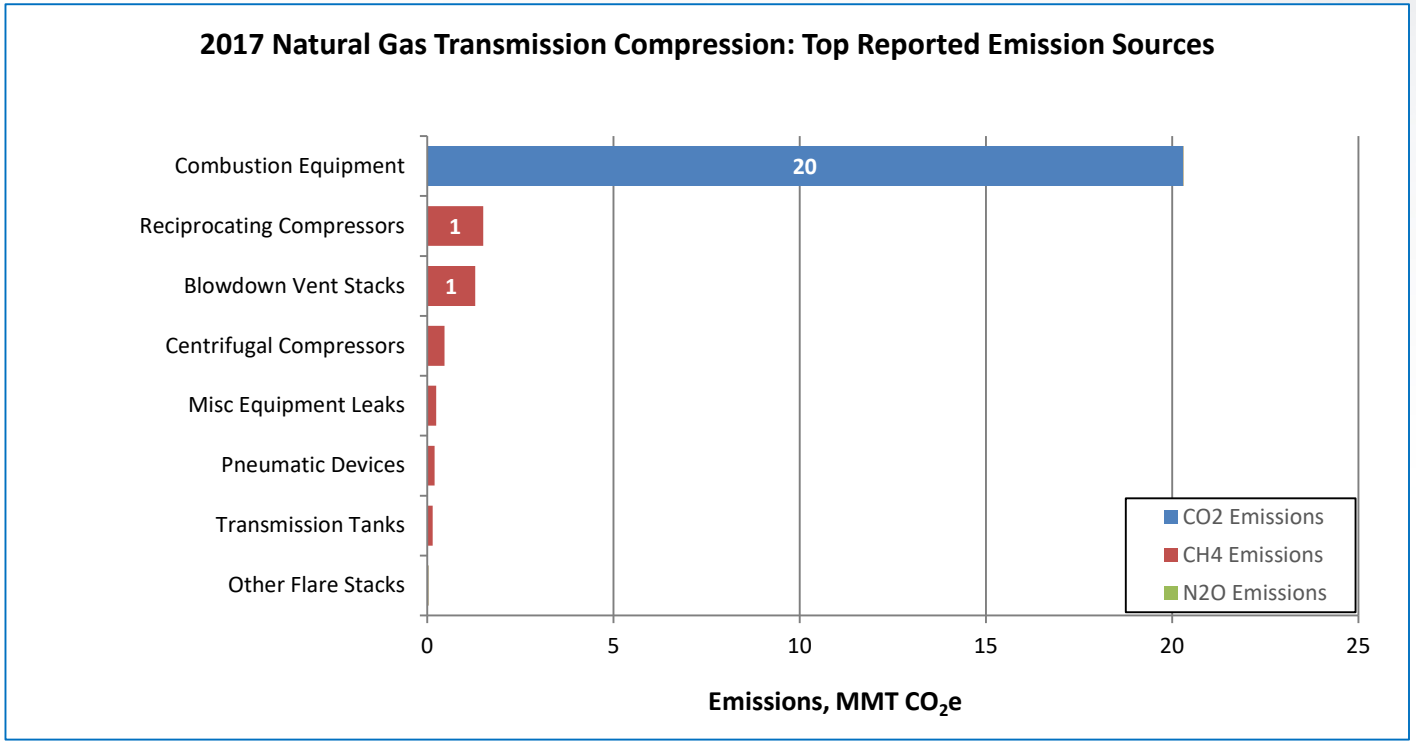
- Reported emissions from natural gas processing totaled 55.8 MMT CO_2e
- Methane emissions totaled 3.1 MMT CO_2e and carbon dioxide emissions totaled 52.8 MMT CO_2e
- The top reported emission sources were combustion equipment (37.7 MMT CO_2e), acid gas removal units (11.3 MMT CO_2e), and other flare stacks (4.1 MMT CO_2e)



GHGRP data as of 8/19/18

Natural Gas Transmission Compression

- Reported emissions from natural gas transmission compression totaled 24.2 MMT CO_2e
- Methane emissions totaled 3.9 MMT CO_2e and carbon dioxide emissions totaled 20.8 MMT CO_2e
- Top reported emission source was combustion equipment (20.8 MMT CO_2e)



GHGRP data as of 8/19/18

Natural Gas Transmission Pipeline

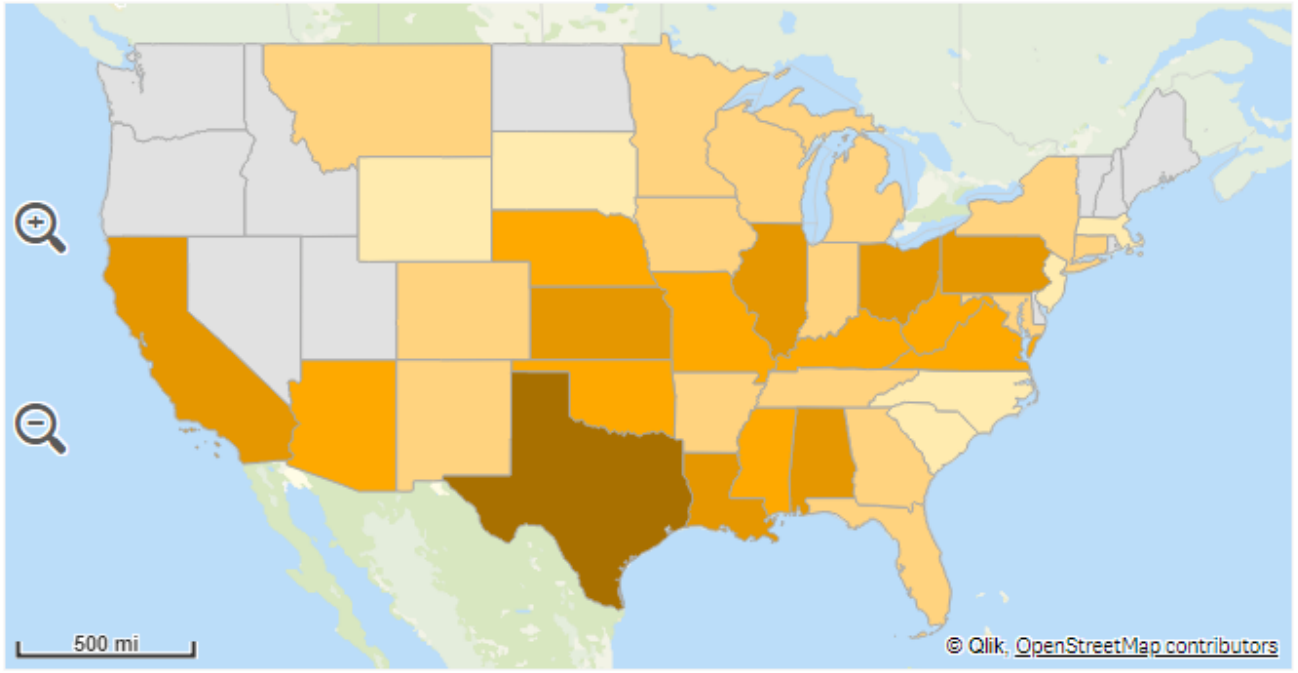
- GHG emissions from the natural gas transmission pipeline segment were first reported in 2016 and contains one reported emission source, blowdown vent stacks

- Reported emissions from natural gas transmission pipeline totaled 2.6 MMT CO_2e

- Methane emissions totaled 2.6 MMT CO_2e and carbon dioxide emissions totaled less than 0.01 MMT CO_2e

GHGRP data as of 8/19/18

Natural Gas Transmission Pipeline



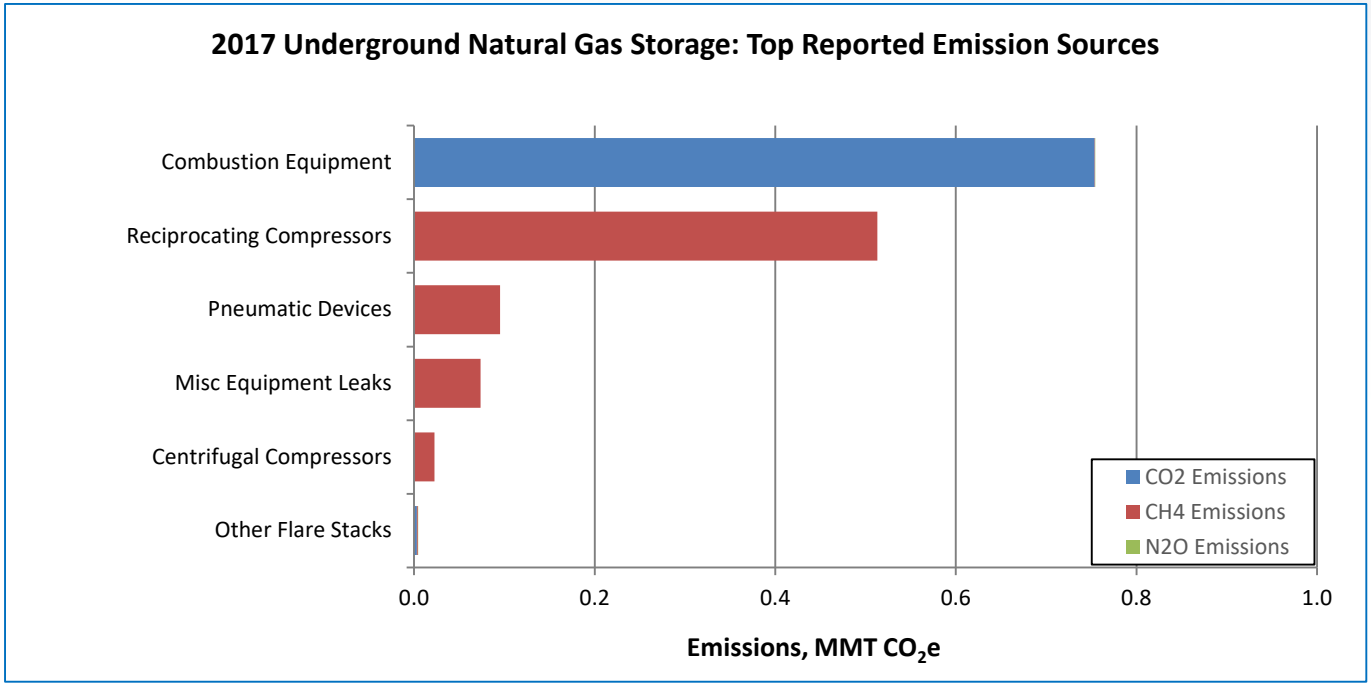
GHGRP, 2017
Onshore Gas Transmission Pipelines Emissions by State (metric tons CO2e)

Range
1 - 5,000
5,000 - 50,000
50,000 - 125,000
125,000 - 300,000
300,000 - 500,000
> 500,000
No reported emissions

GHGRP data as of 8/19/17

Underground Natural Gas Storage

- Reported emissions from underground natural gas storage totaled 1.5 MMT CO_2e
- Methane emissions totaled 0.7 MMT CO_2e and carbon dioxide emissions totaled 0.8 MMT CO_2e
- The top reported emission source was combustion equipment (0.8 MMT CO_2e)

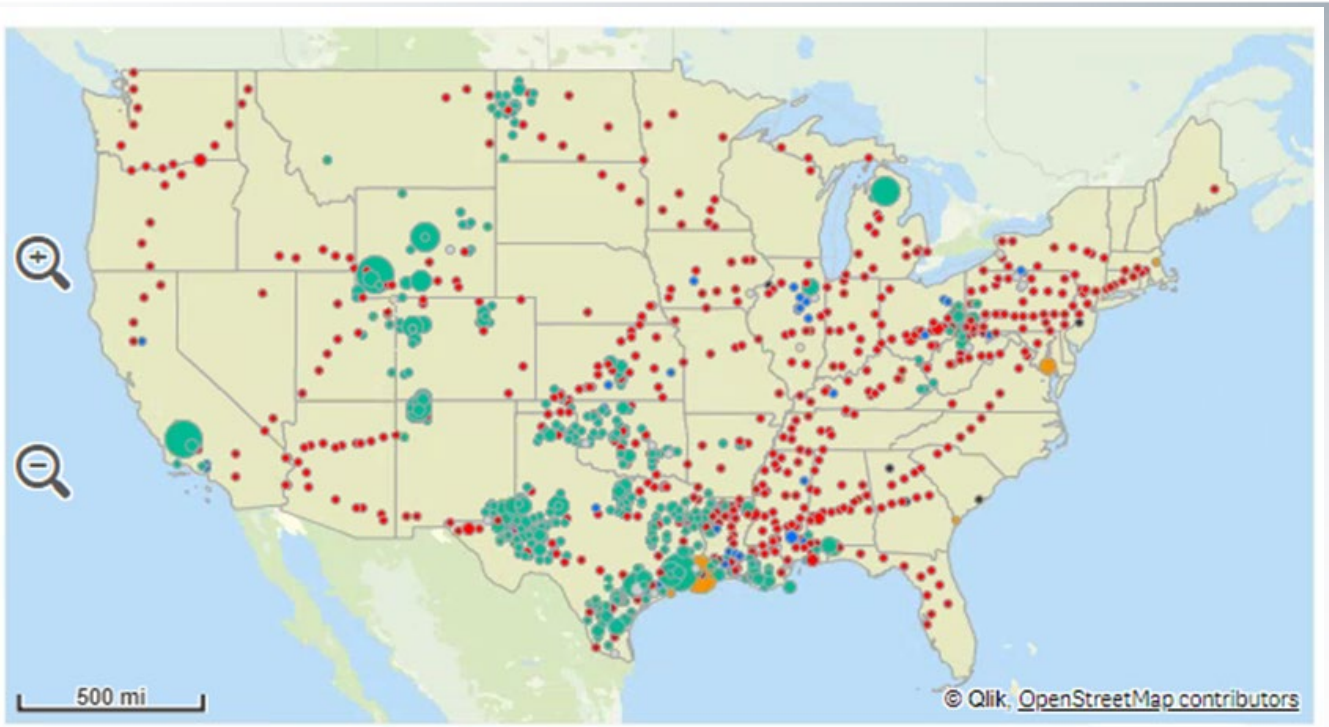


GHGRP data as of 8/19/18

LNG Import/Export and LNG Storage

- LNG Import/Export
  - EPA received emission reports from 6 LNG import/export terminals
  - Reported emissions totaled 3.8 MMT CO_2e
    - Methane emissions totaled 0.04 MMT CO_2e and carbon dioxide emissions totaled 3.7 MMT CO_2e
    - Top reported source of emissions was combustion equipment (3.4 MMT CO_2e)
- LNG Storage
  - EPA received emission reports from 6 LNG storage facilities
  - Reported emissions from LNG storage were less than 0.01 MMT CO_2e

NG Processing, Transmission Compression, Underground Storage, LNG



GHGRP, 2017 Facility Locations and Emissions (metric tons CO_2e)

> 1,000,000

2017 emissions (metric tons CO_2e)

0

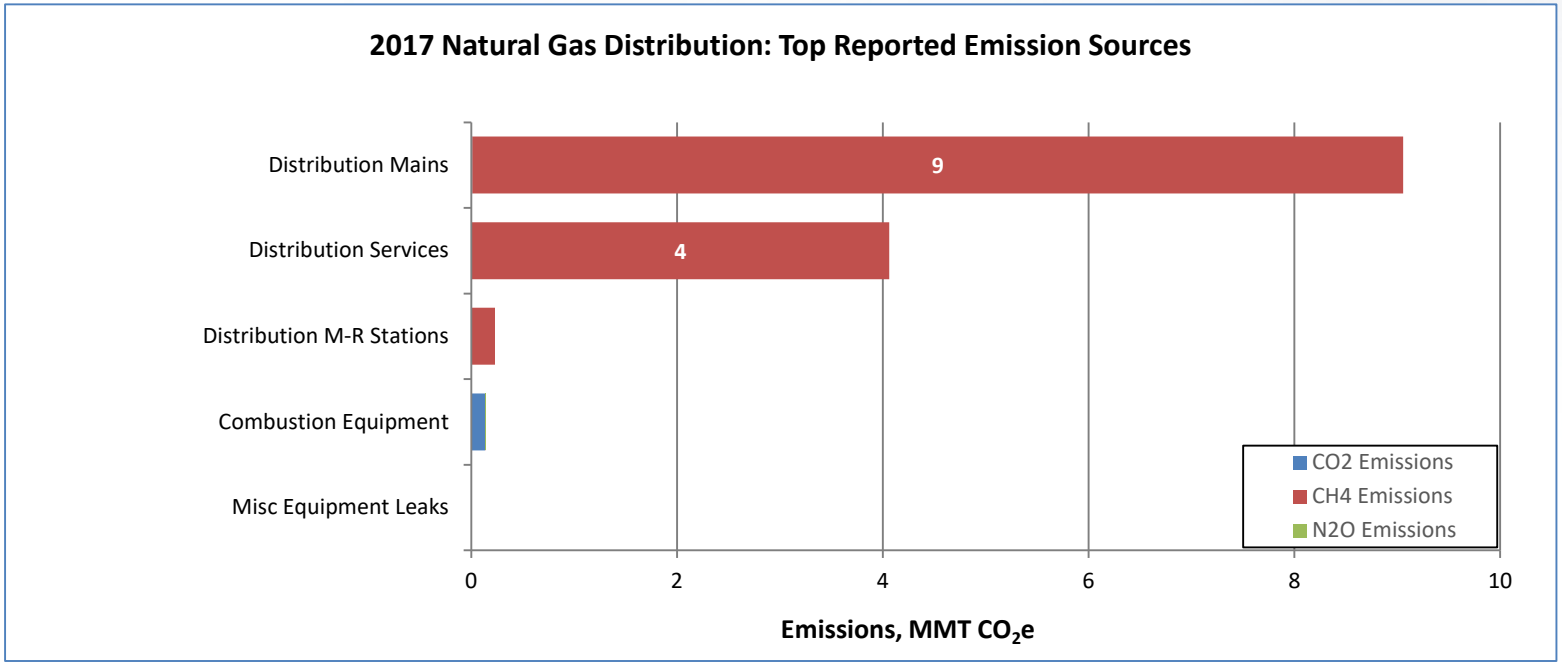
Subsector

- NG Transmission and Compression
- NG Processing
- NG Underground Storage
- LNG Storage
- LNG Import and Export

GHGRP data as of 8/19/17

Natural Gas Distribution

- Reported emissions from natural gas distribution totaled 13.5 MMT CO_2e
- Methane emissions totaled 13.4 MMT CO_2e and carbon dioxide emissions totaled 0.2 MMT CO_2e
- Distribution mains (9.1 MMT CO_2e) and distribution services (4.1 MMT CO_2e) accounted for the majority of reported emissions



GHGRP data as of 8/19/18

For More Information

How to Access GHGRP Data on Petroleum and Natural Gas Systems

- EPA has several data portals to access data collected by the GHGRP on Petroleum and Natural Gas Systems
- EPA's easy-to-use Facility Level Information on GreenHouse gas Tool (FLIGHT) allows users to view GHG data from Petroleum and Natural Gas Systems 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: http://ghgdata.epa.gov/ghgp
- Detailed non-CBI data is available on Envirofacts
  - Access GHG data on Envirofacts: http://www.epa.gov/enviro/facts/ghg/search.html

Informational Webinar

- EPA will be holding an informational webinar to demonstrate its greenhouse gas data publication tool known as “FLIGHT”, as well as Envirofacts
  - The tentative date is Wednesday, October 24
  - For more information, and to register for the webinar see: www.epa.gov/ghgreporting/

Other GHGRP Resources

- GHGRP Subpart W website: http://www.epa.gov/ghgreporting/subpart-w-petroleum-and-natural-gas-systems
- GHGRP Help Desk: GHGReporting@epa.gov