

The EPA logo is a circular emblem with a green border. Inside the border, the words "UNITED STATES" are at the top and "ENVIRONMENTAL PROTECTION AGENCY" are at the bottom. In the center is a stylized green flower with three leaves.

# **EPA Greenhouse Gas Data for Petroleum and Natural Gas Systems**

**November 6, 2019**



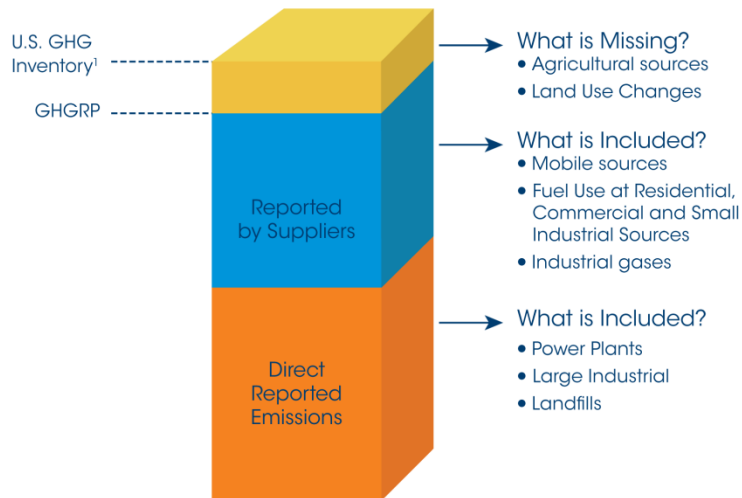
- Overview
- GHGRP
  - Reporting Year 2018 Data
- U.S. GHG Inventory
  - 2018 GHGI Results Overview
  - Oil and Gas CH<sub>4</sub> Trends
  - Updates in the 2018 GHGI
  - Stakeholder Process for 2018 GHGI
- EPA GHG Data Workshop

# GHG Reporting Program and U.S. GHG Inventory



- 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

## GHGRP Covers the Majority of U.S. GHG Emissions



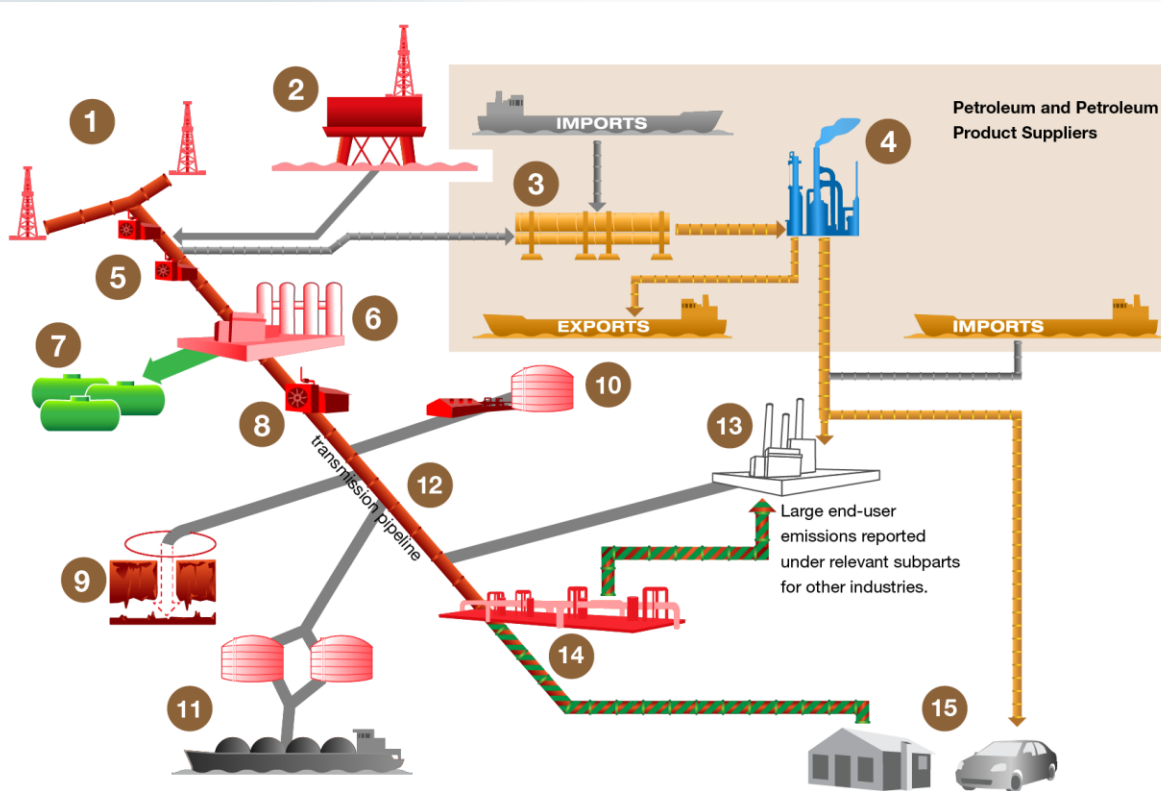
Task	Inventory of U.S. GHG Emissions and Sinks	Greenhouse Gas Reporting Program
Find total U.S. emissions	✓	
Review trend data for the past 20 years	✓	
Browse a map to find largest emitters in your area		✓
Compare facility emissions across an industrial sector		✓
Find <u>reported</u> emissions by state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

# Overview of GHGRP



- Launched in response to FY 2008 Consolidated Appropriations Act
- Annual reporting of GHGs by 41 source categories
  - Generally: 25,000 metric ton CO<sub>2</sub>e reporting threshold
- 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 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. Liquefied 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

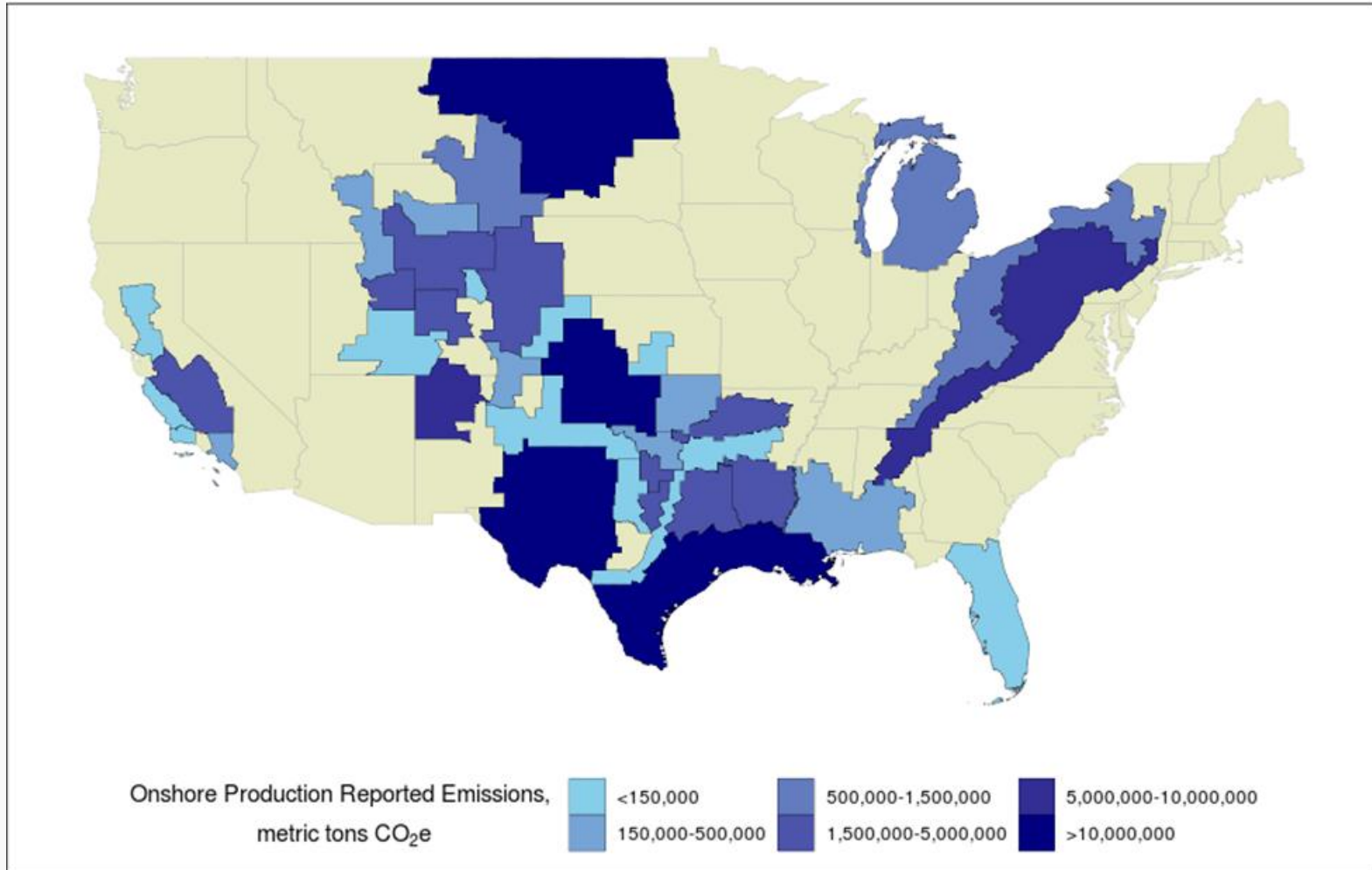
<span style="color: red;">■</span>	Subpart W: Emissions from petroleum & natural gas systems
<span style="color: blue;">■</span>	Subpart Y: Emissions from petroleum refineries
<span style="color: orange;">■</span>	Subpart MM: CO <sub>2</sub> associated with supplies of petroleum products
<span style="color: green;">■</span>	Subpart NN: CO <sub>2</sub> associated with supplies of natural gas & natural gas liquids
<span style="color: gray;">■</span>	Not reported under GHGRP

# GHGRP RY2018 Subpart W Emissions by Industry Segment



Segment	Number of Facilities	2018 Reported Emissions (Million Metric Tons CO <sub>2</sub> e)
Onshore Production	500	109
Offshore Production	144	7
Gathering and Boosting	334	81
Natural Gas Processing	455	57
Natural Gas Transmission Compression	563	28
Natural Gas Transmission Pipeline	41	3
Underground Natural Gas Storage	48	1
LNG Import/Export	9	7
LNG Storage	5	<1
Natural Gas Distribution	161	13
Other Oil and Gas Combustion	82	9
<b>Total</b>	<b>2,319</b>	<b>316</b>

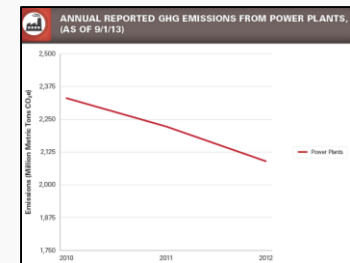
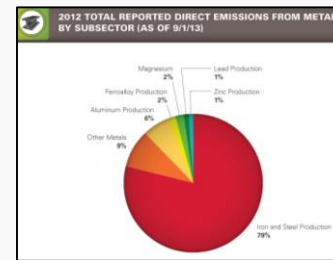
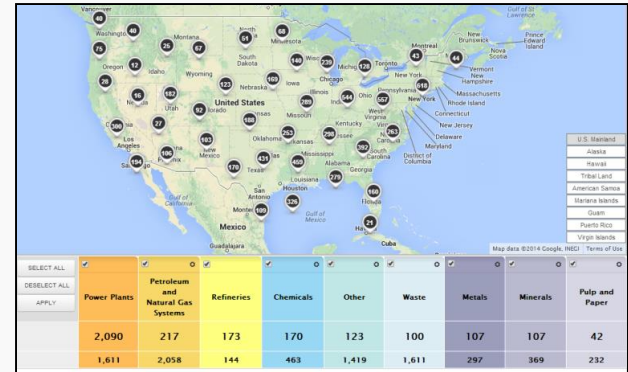
# GHGRP RY2018 Onshore Production Emissions by Basin



# How to Access GHGRP Data



- EPA makes GHGRP data publicly available through several portals
- FLIGHT (<http://ghgdata.epa.gov>)
  - View data in a variety of ways
- Envirofacts (<https://www.epa.gov/enviro/greenhouse-gas-customized-search>)
  - Detailed non-CBI data
- Data Highlights (<https://www.epa.gov/ghgreporting/ghgrp-reported-data>)
  - Summary of data reported in each sector







# Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHGI)

# U.S. Greenhouse Gas Inventory Background

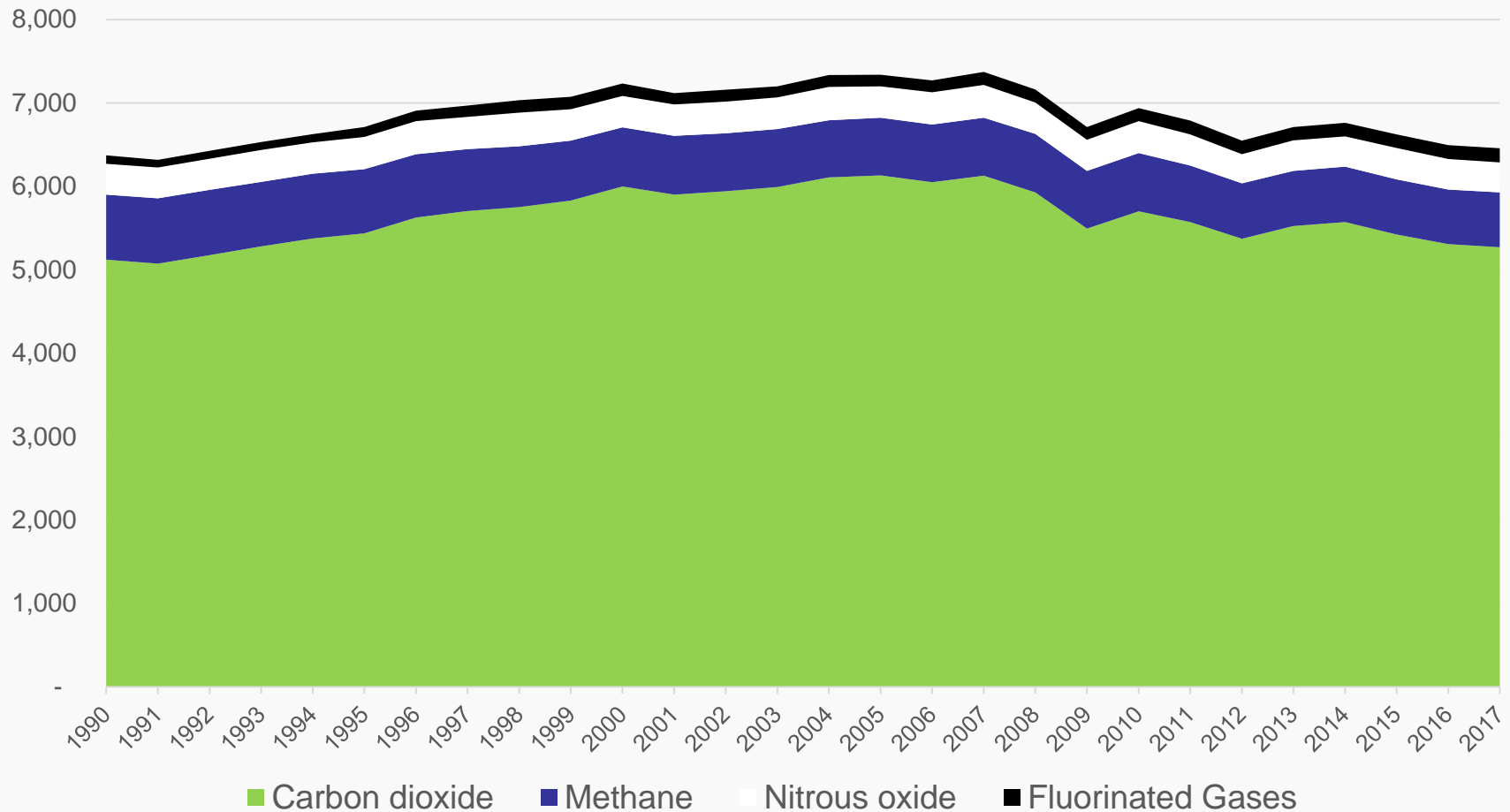


- Official U.S. estimate of greenhouse gas emissions for reporting to United Nations Framework Convention on Climate Change (UNFCCC)
  - Annual national-level inventory submissions to the UNFCCC since 1994
  - Emission estimates begin in 1990; most current inventory covers 1990-2014
- EPA leads Inventory development, working with several other agencies (e.g., agriculture, energy) to prepare estimates and provide activity data
- Sectors Covered
  - Energy, Industrial Processes, Agriculture, Land-Use Change and Forestry, and Waste
- Gases Covered
  - CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, NF<sub>3</sub>, SF<sub>6</sub>
  - Reported in mass of each gas, and as global warming potential (GWP)-weighted CO<sub>2</sub>e emissions
- Record of emissions trends over time
- Each year, Inventory undergoes expert review, public review, and UNFCCC review

# U.S. GHG Emissions by Gas



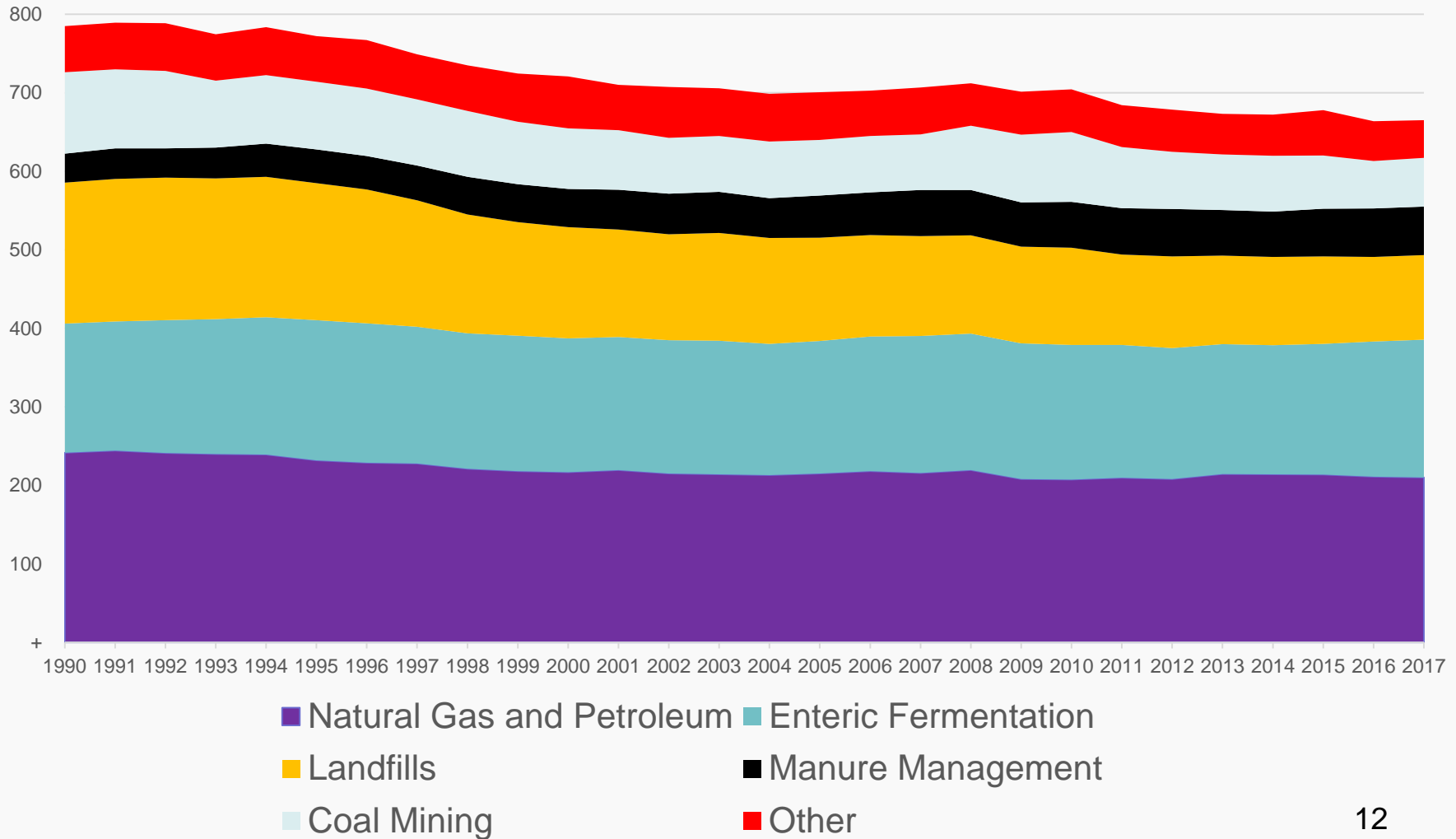
U.S. GHG Emissions by Gas, MMT CO<sub>2</sub>e



# U.S. Methane Trends 1990-2017



U.S. Methane, MMT CO<sub>2</sub>e



# Calculating U.S. GHG Emissions from Oil and Gas

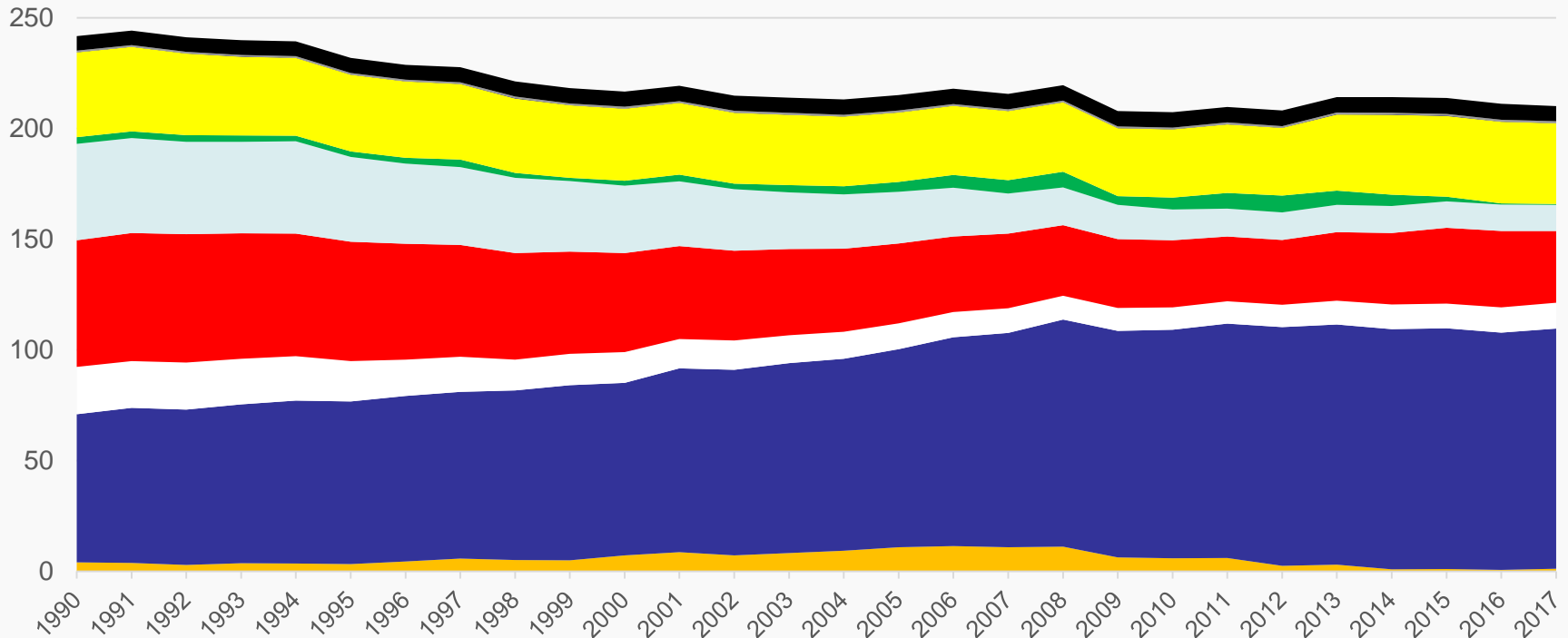


- Inventory is stratified into natural gas and petroleum pathways of the industry
  - Natural gas - offshore production, onshore production, gas processing, gas transmission, underground gas storage, LNG storage, LNG import and export terminals, and gas distribution
  - Petroleum – offshore production, onshore production, oil transportation, and refineries
- Oil and gas in inventory covers hundreds of types of sources
- Basic approach is to multiply national activity data by emission factors, e.g.:
  - Miles cast iron pipeline x  $\text{CH}_4$  per mile cast iron pipeline
  - # residential meters x  $\text{CH}_4$  per residential meter

# Oil and Gas CH<sub>4</sub> Trends



Methane, MMT CO<sub>2</sub>e



- Gas Exploration
- Gas Processing
- Gas Distribution
- Oil Production

- Gas Production
- Gas Transmission and Storage
- Oil Exploration
- Oil Transportation

# Updating Oil and Gas CH<sub>4</sub> in the GHGI



- Large amount of data and information newly available
- Opportunity to re-evaluate and make updates to GHG Inventory
- Stakeholder process
  - Webinar
  - Memos
- Public review draft and memo comments

# Overview of Methane in 2019 GHGI



Segment	Last year's 2016 GHGI Estimate	Updates in the 2019 GHGI	Updated 2016 GHGI Estimate
Oil Exploration	2.1 MMT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Use of GHGRP data for HF completions</li> <li>• Use of Drilling Info data for wells drilled</li> </ul>	0.5 MMT CO <sub>2</sub> e
Gas Production	106.8 MMT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Use of GHGRP data for gathering pipelines</li> </ul>	107.1 MMT CO <sub>2</sub> e
Transmission and Storage	32.8 MMT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Use of GHGRP data for transmission pipeline blowdowns</li> <li>• Use of GHGRP data for LNG sources</li> </ul>	34.5 MMT CO <sub>2</sub> e
Other Segments	60.4 MMT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• No revisions (only activity data refreshes)</li> </ul>	61.8 MMT CO <sub>2</sub> e
<b>Total</b>	<b>202.1 MMT CO<sub>2</sub>e</b>		<b>203.9 MMT CO<sub>2</sub>e</b>





- Series of webinars and workshops
- EPA and stakeholder presentations with new data or analyses that could be used to update the GHG Inventory
- EPA invites stakeholder feedback on updates under consideration, including
  - Offshore oil and gas
  - Gathering and boosting

# 11/7 Stakeholder Workshop Agenda



- *Overview of GHGI and GHGRP, **EPA***
- *Update on GHGRP and Reporting Year 2018 Data, **EPA***
- *Equipment Leaks Study, **API***
- *Atmospheric Constraints on Methane Inventories: How Much Do We Know and How do We Know It?, **Penn State***
- *Offshore Oil and Gas Update Under Consideration for GHGI, **EPA***
- *Overview of Recent Compressor Station Measurements and High Flow Testing, **Colorado State***
- *Gathering and Boosting Update Under Consideration, **EPA***

# Resources



- Stakeholder Process: <https://www.epa.gov/ghgemissions/stakeholder-process-natural-gas-and-petroleum-systems-1990-2018-inventory>
- GHG Inventory: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>
- Additional detail on natural gas and petroleum systems in the GHG Inventory: <https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systems>
- Relationship of GHGRP and GHG Inventory: <https://www.epa.gov/ghgreporting/greenhouse-gas-reporting-program-and-us-inventory-greenhouse-gas-emissions-and-sinks>