

Natural Gas & Petroleum Systems - 2018 GHGI Public Review Draft

Stakeholder Webinar

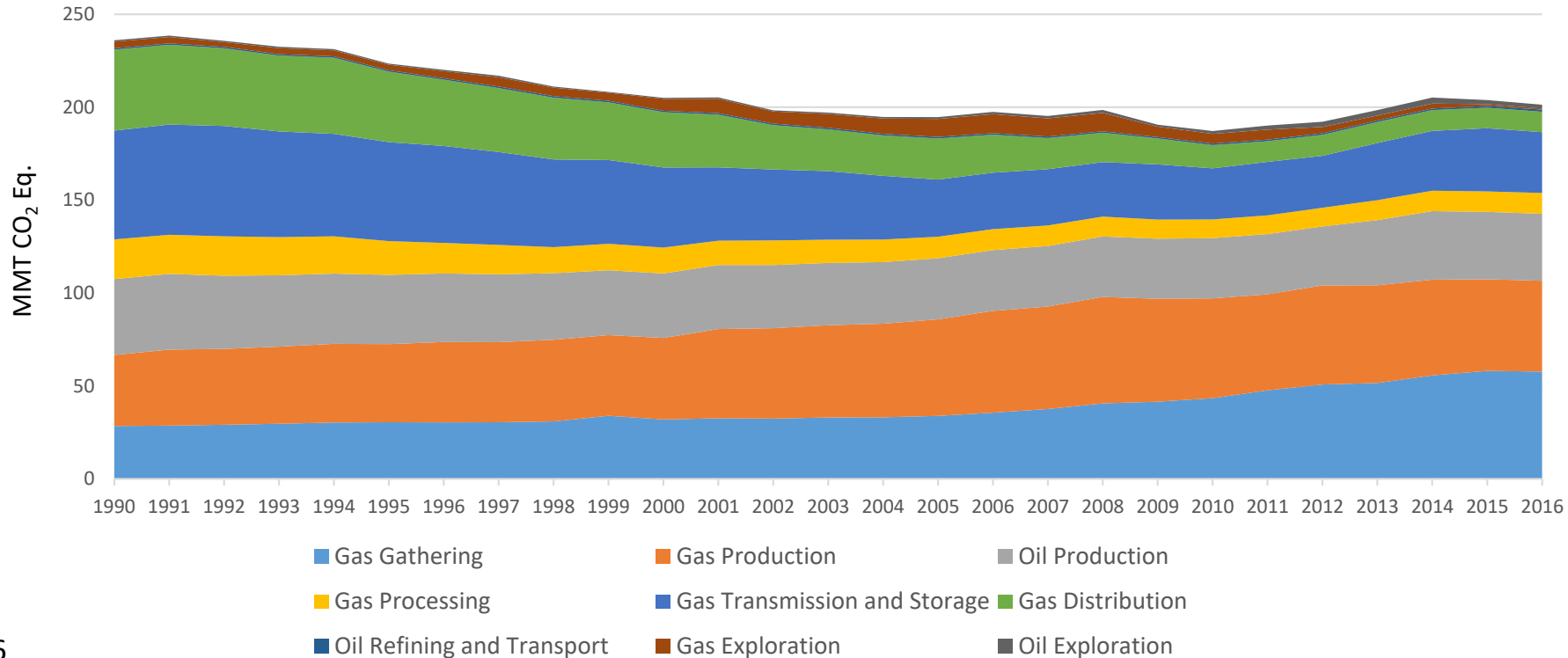
March 1, 2018

Outline

- 2018 Public Review (PR) Draft Greenhouse Gas Inventory (GHGI) Results Overview
- Changes from 2017 Final GHGI to 2018 PR GHGI
- Improvements Under Consideration for 2018 Final GHGI and Future GHGI
- Requests for Stakeholder Feedback

2018 PR Results Overview

CH₄ - 2018 PR Results & Trends



Trends

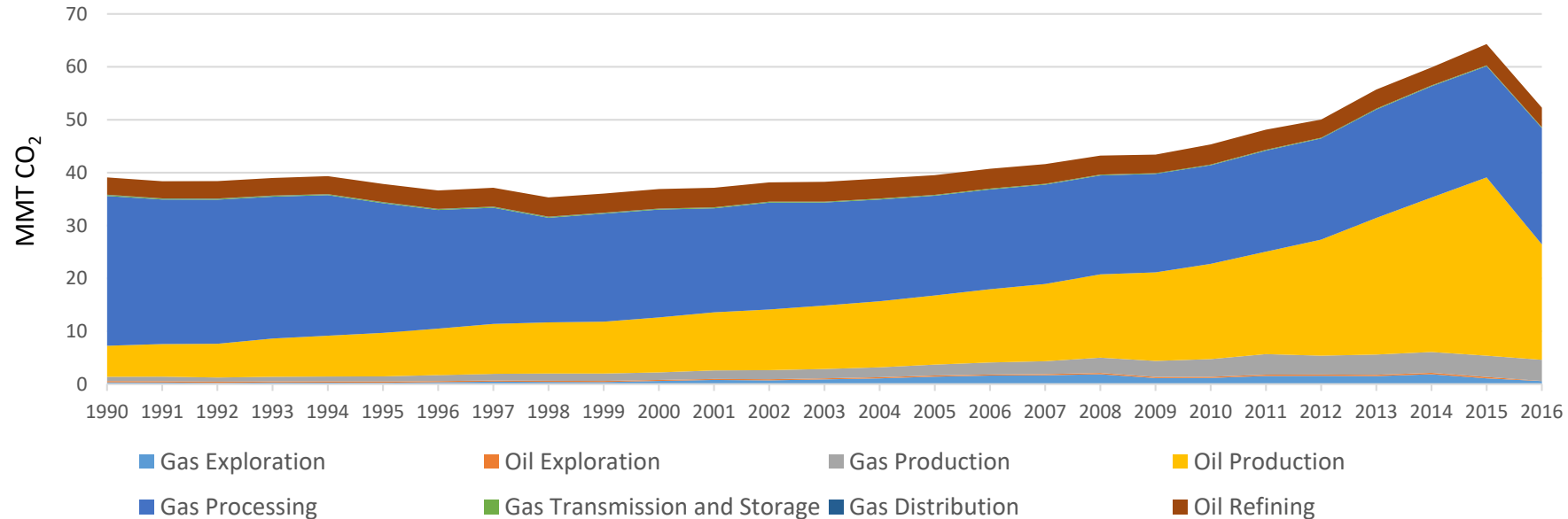
1990-2016

- Overall decrease of 15%
- Largest decreases in distribution (upgrades to pipeline materials and stations) and transmission and storage (changes in compressor types)
- Large increases in gas gathering (due to increases in gas produced) and gas production (due to increased equipment counts)

2015-2016

- Overall decrease of 1%
- Largest decrease in transmission and storage (due to decreased 2016 emissions from 2015-2016 Aliso Canyon leak compared to 2015)

CO₂ - 2018 PR Results & Trends



Trends

1990-2016

- Overall increase of 34%
- Largest increases in oil and gas production emissions (due to increased flaring, especially at tanks)

2015-2016

- Overall decrease of 19%
- Largest decrease in oil production (due to decreased flaring of associated gas)

Changes from 2017 Final to 2018 PR

Overview of Revisions for 2018 PR

- Exploration (distinct segment)
 - Well Testing
 - HF Gas Well Completions
 - Non-HF Gas Well Completions
- Production
 - Associated Gas
 - Miscellaneous Production Flaring
 - Production Tanks
 - Pneumatic Controllers
 - Pneumatic Pumps
 - HF Gas Well Workovers
 - Non-HF Gas Well Workovers
 - Liquids Unloading
 - Well Equipment (e.g., separators)
- Processing
 - Grouped Sources (e.g., Flares, Compressors)
 - AGR
 - Blowdowns and Venting
- Transmission and Storage
 - Flares
 - Pneumatic Controllers
- Uncertainty (revised analysis)
- Abandoned Wells (new category)

Overview of CO₂ Updates

Two main types of updates:

1. Subpart W data are used in the GHGI to calculate CH₄ emissions for numerous production, processing, and transmission and storage sources → to create consistency, EPA applied the existing subpart W-based CH₄ methodology to calculate CO₂ EFs
 2. EPA developed a new methodology to use subpart W data for sources that were not already based on subpart W
- Largest impact for sources with flaring, and updates resulted in a reallocation of flaring CO₂ emissions from natural gas to petroleum systems

Overview of Uncertainty Updates

- Performed a detailed uncertainty analysis for sources that contribute 75% of emissions for natural gas and petroleum systems (i.e., modeled sources)
 - A detailed uncertainty analysis was not conducted for the remaining sources (i.e., unmodeled sources)
 - Used 2017 Final emissions and methodologies
- There are 3 main steps to determine the total uncertainty:
 1. Calculate uncertainty for each modeled source--characterize the probability density function for each input (e.g., EF and AF)
 2. Estimate uncertainty for the unmodeled sources
 3. Combine uncertainty for the modeled and unmodeled sources to estimate source category total uncertainty
- For each step, Monte Carlo simulations were used (IPCC Approach 2)

Analysis	Natural Gas Systems		Petroleum Systems	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
2011 Analysis	-19%	+30%	-24%	+149%
2018 PR	-15%	+17%	-32%	+36%

Overview of Abandoned Wells Update

- New category for the Inventory
- Plugged and unplugged EFs were developed at the national-level and for the Appalachia region
 - Appalachia region EFs were applied to abandoned wells in the Appalachian basin region, and the national-level EFs were applied to all other abandoned wells
- Population of abandoned wells, including split between plugged and unplugged wells, were based on Drillinginfo and historical data

Year	Abandoned Well Count (millions)			Plugging Status (%)		Population in Each Region (%)	
	Total	Gas	Oil	Unplugged	Plugged	Appalachia	Other
1990	2.37	0.32	2.05	81	19	26	74
2016	3.35	0.72	2.63	69	31	24	76

Regional EFs (g/h/well)	Unplugged	Plugged
National	10	0.002
Appalachian	23	0.36

Other Updates for 2018 PR

- Reorganized Inventory to include a specific exploration segment, which includes:
 - HF and non-HF well completions
 - Well drilling
 - Well testing (new source)
- Updated well counts

CO₂ Recalculations

- 38% increase from 2017 Final to 2018 PR
 - Due to new flaring estimates

Segment	2017 Final - 2015 Estimate (CO ₂)	2018 PR - 2015 Revised Estimate (CO ₂)
Production	19.2 MMT (Gas: 18.6 MMT; Oil: 0.6 MMT)	39.1 MMT (Gas: 5.1 MMT; Oil: 34.0 MMT)
Processing	23.7 MMT	21.0 MMT
Transmission and Storage	0.0 MMT	0.1 MMT
Distribution	0.0 MMT	0.0 MMT
Refineries	2.9 MMT	4.0 MMT
Total	46.5 MMT	64.3 MMT

CH₄ Recalculations

- <1% increase from 2017 Final to 2018 PR

Segment	2017 Final -2015 Estimate (CO ₂ e)	2018 PR – 2015 Estimate (CO ₂ e)
Production	145.6 MMTCO ₂ e (Gas: 106.6 MMTCO ₂ e; Oil: 39.0 MMTCO ₂ e)	146.8 MMTCO ₂ e (Gas: 108.3 MMTCO ₂ e; Oil: 38.5 MMTCO ₂ e)
Processing	11.1 MMTCO ₂ e	11.0 MMTCO ₂ e
Transmission and Storage	33.7 MMTCO ₂ e	34.0 MMTCO ₂ e
Distribution	11.0 MMTCO ₂ e	11.0 MMTCO ₂ e
Refineries and transport	0.8 MMTCO ₂ e	0.9 MMTCO ₂ e
Total	202.2 MMTCO₂e	203.8 MMTCO₂e
Abandoned Wells	N/A	7.2 MMTCO ₂ e (Gas: 1.4 MMTCO ₂ e; Oil: 5.8 MMTCO ₂ e)

Improvements Under Consideration for 2018 Final GHGI and Future GHGI

Stakeholder Feedback

- EPA is seeking stakeholder feedback on updates in the public review draft
- EPA is considering implementing improvements to the updates in the PR draft based on feedback received through 2017-2018 stakeholder process
- EPA is also seeking stakeholder feedback on potential updates for future GHG Inventories
- Public review draft comment deadline: March 9, 2018.
 - Instructions for how to comment on last slide

Improvements under consideration for 2018 Final

Associated Gas Venting and Flaring

- For 2018 PR, applied basin-level, well-based approach
 - Approach applied to 4 basins that contribute at least 10% of total CO₂e emissions in any year (Gulf Coast, Anadarko, Williston, and Permian) and all other basins were grouped together
- For 2018 Final, considering basin-level, production-based approach. Would result in a decrease in emissions

Miscellaneous Production Flaring

- For 2018 PR, applied national-level, well-based approach
- For 2018 Final, considering basin-level, production-based approach. Would result in a decrease in emissions
 - Could apply approach to 3 basins that contribute at least 10% of total CO₂e emissions in any year (Gulf Coast, Williston, and Permian) and group all other basins together

Improvements under consideration for 2018 Final

Uncertainty Analysis

- 2018 PR uncertainty calculations were based on data from 2017 Final; abandoned wells uncertainty from calculated oil and gas uncertainty
- 2018 Final uncertainty will be calculated using 2018 GHGI top-ranked sources with 2018 GHGI methodologies; abandoned wells uncertainty to be updated with abandoned well-specific data

Year-Specific Emission Factors

- Current GHGI uses EFs from data averaged over a number of years to calculate emissions for certain sources, including HF gas well completions and liquids unloading
- For 2018 Final, considering year-specific EFs for some sources. Will consider others in future GHG Inventories

Basin-Level Approach for Additional Sources

- Current GHGI applies national-level approach to certain sources
- For 2018 Final, considering basin-level approach for liquids unloading. Will consider others in future GHG Inventories

Gas STAR Reductions

- 2018 PR draft noted potential corrections to Gas STAR reductions (next slide)

Gas STAR Reductions for Final 2018 GHGI

- For 2018 Final, considering adjusting Gas STAR reductions from:

Reduction Activity	Year 2016 Source Reduction (MMT CO ₂ e)	Impact on Segment-Total Year 2016 Reductions (MMT CO ₂ e)	
		2018 PR	Considering for 2018 Final
“Other” production segment activities	1.1	8.9	7.9
Transmission and storage station fugitives	0.1	8.3	8.2
Miscellaneous unclassified activities within “other” reductions for transmission and storage segment	+		
Distribution mishaps/dig-ins and pipeline blowdowns	+	1.0	0.0
Miscellaneous unclassified activities within “other” reductions for distribution segment	1.0		

+ less than 0.05

Stakeholder Feedback Request: Associated Gas Venting and Flaring and Miscellaneous Flaring

- Approaches for associated gas venting and flaring and miscellaneous production flaring
 - Basin-level, well-basis
 - Basin-level, production basis
- Time series data

Stakeholder Feedback Request: Abandoned Wells

- Calculating uncertainty surrounding activity data estimates for abandoned wells
- Which scenario using "Entire U.S.", "Appalachian" and "Western U.S." EFs best represents U.S. emissions from abandoned wells; alternative approaches to consider
- Population of wells abandoned prior to 1990 (considering that the production phase of many such wells likely pre-dates DrillingInfo coverage)
- Split between plugged and unplugged wells existing in each year of the time series (1990–2016)

Other Requests for Stakeholder Feedback

- EPA seeks feedback on other updates under consideration, outlined in memo https://www.epa.gov/sites/production/files/2017-10/documents/2018_ghgi_ng-petro_revisions_under_consideration_2017-10-26_pdf_to_post.pdf
- Well-related activity data—potential data sources or methodology to update counts of wells drilled (categorized as oil, gas, and dry) across the time series, or specifically for years 2011 forward
- LNG—use of subpart W data to update the GHG Inventory
- N₂O—use of subpart W data to include N₂O emissions in the GHG Inventory
- Liquids unloading early time series estimates
- Offshore production—use of most recent BOEM data in the GHG Inventory
- Natural gas point of use emissions
- Other uses of subpart W data (e.g. use of gathering and boosting and HF oil well completions data for 2019 GHG Inventory)

Commenting on Public Review Draft

- Comment deadline: March 9, 2018
- Can submit comments online or via email
 - Online: Follow the online instructions for submitting comments to the Draft Inventory Report [Docket at EPA-HQ-OAR-2017-0729](#) from the Federal Register Notice [[FRL-9974-04-OAR](#)].
 - Email: Comments can be sent to GHGInventory@epa.gov. These comments will also be posted to the [docket](#).
- Draft GHG Inventory: <https://www.epa.gov/ghgemissions/draft-inventory-us-greenhouse-gas-emissions-and-sinks-1990-2016>
- Draft GHGI Energy Chapter: https://www.epa.gov/sites/production/files/2018-01/documents/2018_chapter_3_energy.pdf
 - Petroleum Systems: Pages 65-77
 - Natural Gas Systems: Pages 77-93
 - Abandoned Oil and Gas Wells: Pages 93-96
- Annex excel files for oil and gas: <https://www.epa.gov/ghgemissions/stakeholder-process-natural-gas-and-petroleum-systems-1990-2016-inventory>