Natural Gas & Petroleum Systems: Updates Under Consideration for 2023 GHGI

Stakeholder Webinar

November 29, 2022

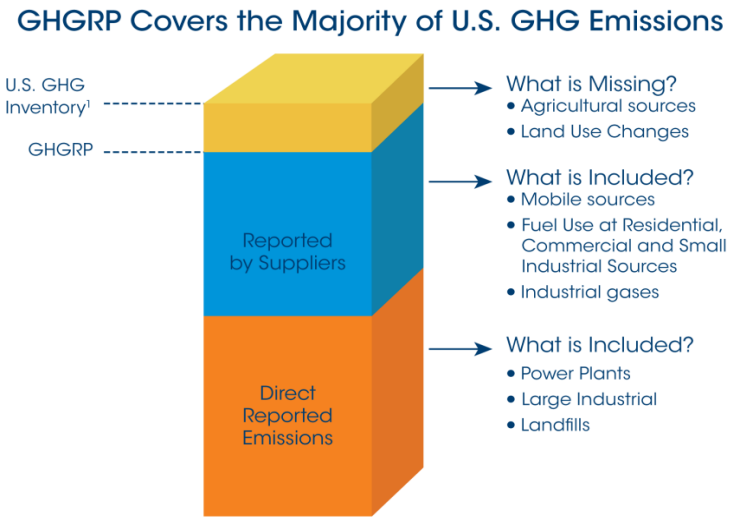
11/29 Stakeholder Webinar Agenda

- GHG Inventory Overview – EPA
- Update on the GHGRP: Petroleum and Natural Gas Systems – EPA
- Updates Under Consideration for 2023 GHGI – ERG
- Building Measurement-Based Methane Inventories from Large Scale Source-Resolved Aerial Data – Matt Johnson, Carleton University
- Reliability of Emission Reduction Trends in Canada – Scott Seymour, EDF
- IRA and Methane – EPA
- Wrap Up – EPA

GHG Inventory Overview

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

- Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHGI), the U.S. official GHG Inventory submission to UNFCCC, tracks total annual U.S. emissions across all sectors of the economy, using mostly 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 sources and sinks (i.e., GHGRP does not include agriculture, land use, and small sources)



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

EPA Oil and Gas GHGI Stakeholder Process

- Annual stakeholder process to discuss new data and improvements to GHGI data
- Typically hold two webinars/workshops in the development of each GHGI
- 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

Overview of State-level GHGI and Gridded CH_4 GHGI

GHGI State-Level Estimates

- New (first published 2022), fully disaggregated national GHGI across the 50 States for all gases, sectors, and categories
  - Ensure consistency with the national GHGI in terms of emission and removal totals across the time series, from 1990 to the most recent inventory year.
  - Annual updates on a regular schedule
- Support researchers, policymakers, and the general public
- Dataset should not be viewed as official data of any state government

https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals

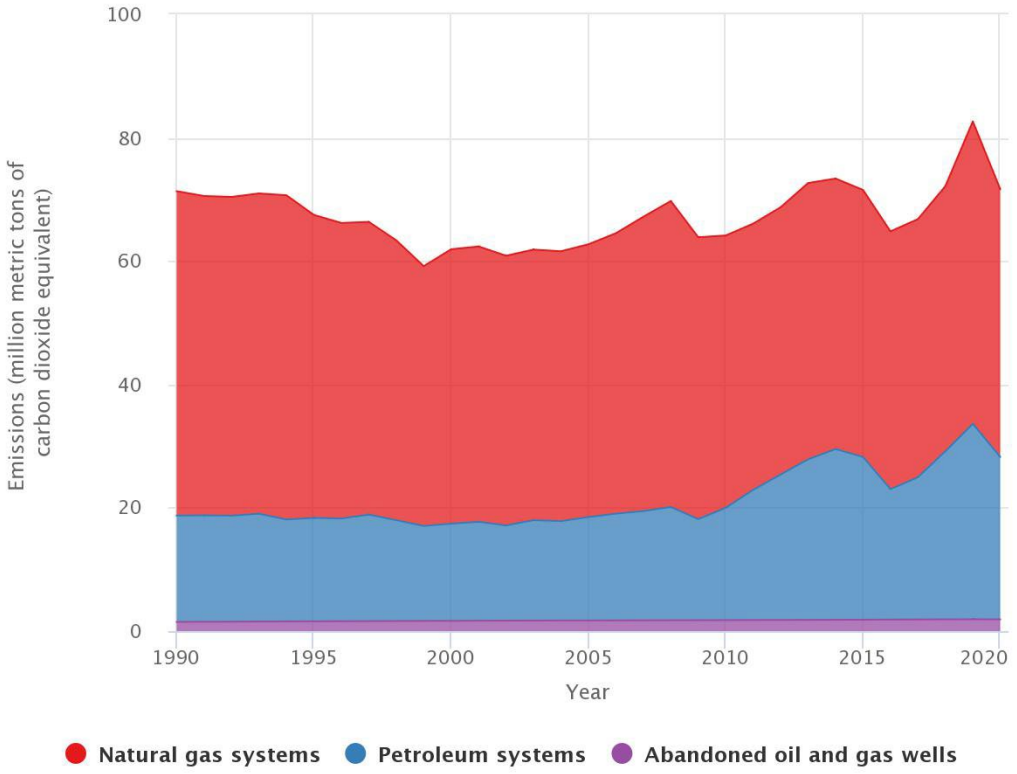
GHG State-Level Estimates for Oil and Gas

Approach to allocate emissions to state-level

- National GHGI emissions are allocated to each state using datasets with state-specific data that are used to represent the relative contributions of state emissions to the national total
  - e.g., state-specific well counts, pipeline miles, production
- Approach reflects state-variations for some sources
  - e.g., pipeline materials, number and types of wells
- Approach does not reflect certain other variation
  - e.g., differences in technologies and practices, impacts of state regulations

Example: Texas

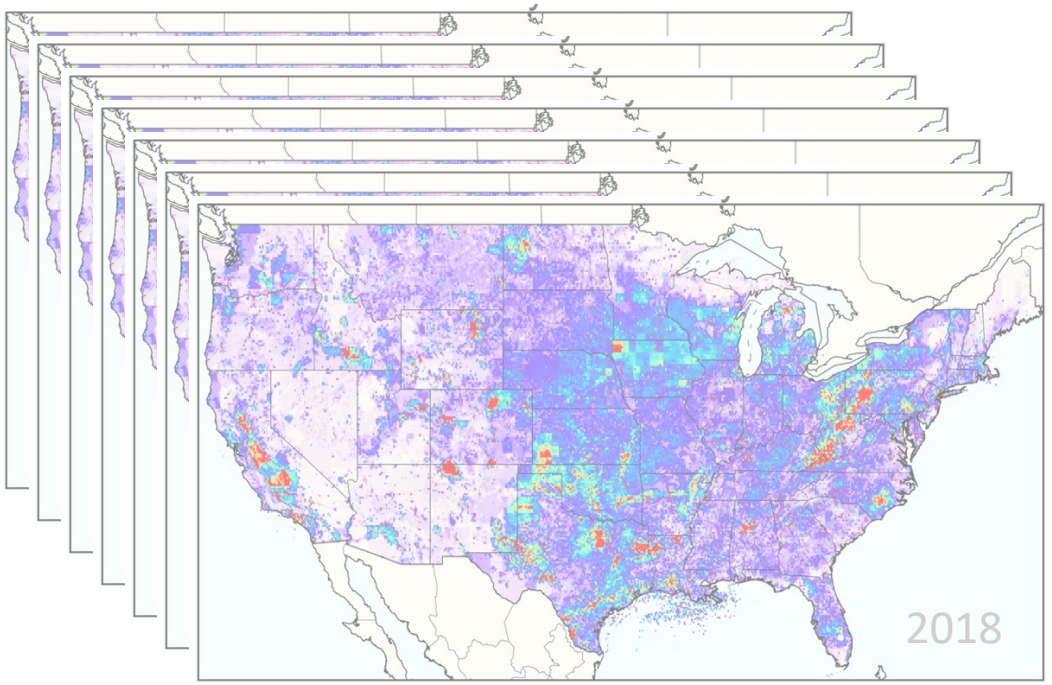
Texas Greenhouse Gas Emissions from Natural Gas and Petroleum Systems, by Category, 1990–2020



Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990–2020. https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals

GHGI – Gridded Methane Emissions

- Spatially and temporally disaggregated version (~10 x 10 km, monthly resolution) of all methane emission sources in the GHGI
- Allows for more direct comparison between the GHGI and the time and location of atmospheric methane observations/emission rates
- Is used as a prior estimate for inversions of atmospheric methane



Version 1 – Published 2016

- Emissions for 2012
- Based on 2016 GHGI
- Research study effort

Version 2 – To be finalized 2022

- Timeseries (2012 - 2018)
- Based on 2020 GHGI
- Development of a system to streamline future updates

https://www.epa.gov/ghgemissions/gridded-2012-methane-emissions

Update Under Consideration for 2023 GHGI: Incorporation of additional Basin-Level Production data

Overview of Update Under Consideration

- EPA is considering updating the GHGI production segment to develop emissions estimates using basin-specific data from GHGRP subpart W
- The incorporation of this data will improve future versions of both the gridded and state-level inventories
- This will allow EPA to use the gridded inventory for improved comparisons with atmospheric observation studies (as regions will reflect the local differences in emissions rates as reported to GHGRP)
- In addition, this will allow the state-level inventory to more closely reflect state-level programs, formation type mixes, and technologies and practices

Incorporating Additional Geographically Disaggregated Data into GHGI

Update under consideration: Where appropriate, incorporate more disaggregated data into GHGI methodologies → develop basin-specific emission factors (EFs) and activity factors (AFs) from subpart W data

Approach for each industry segment:

1. Examine the **variability** of the data at basin-level
2. Calculate the **coverage** of subpart W data for each basin
3. Consider the impacts of coverage and variability on national emissions

Background – Variability

Consideration: For each emission source, to what extent do emissions activities vary from basin-to-basin, such that national-level averages would not capture that variation

Assessment:

- Identified relevant emissions or activity comparisons by emission source to help assess variability in O&G emissions between basins
- Performed uniquely for each emission source
- Example: how do the number of pneumatic controllers per well vary across basins?

Background – Coverage

Consideration: Whether basin-level EFs/AFs would more appropriately represent emissions than a national average

- e.g. if only 5% of a basin's activity is reported, would a basin-level EF be appropriate, versus use of a national average for that basin, due to limited data?

Assessment:

- Estimated the % of each basin's production operations that subpart W represents
  - Subpart W reporters are a subset of the national population due to reporting threshold

$$\%\ \text{Coverage}_{Basin} = \text{Subpart W Activity}_{Basin} \div \text{National Dataset Activity}_{Basin}$$

Background – Coverage (cont.)

- Considering whether to apply a coverage threshold
- E.g., for each emission source, could calculate emissions using:
  1. National-level factors
  2. Basin-level factors for all basins
  3. Basin-level factors for basins meeting certain coverage threshold and an average factor for others
- For this assessment, used 50% coverage threshold as an example

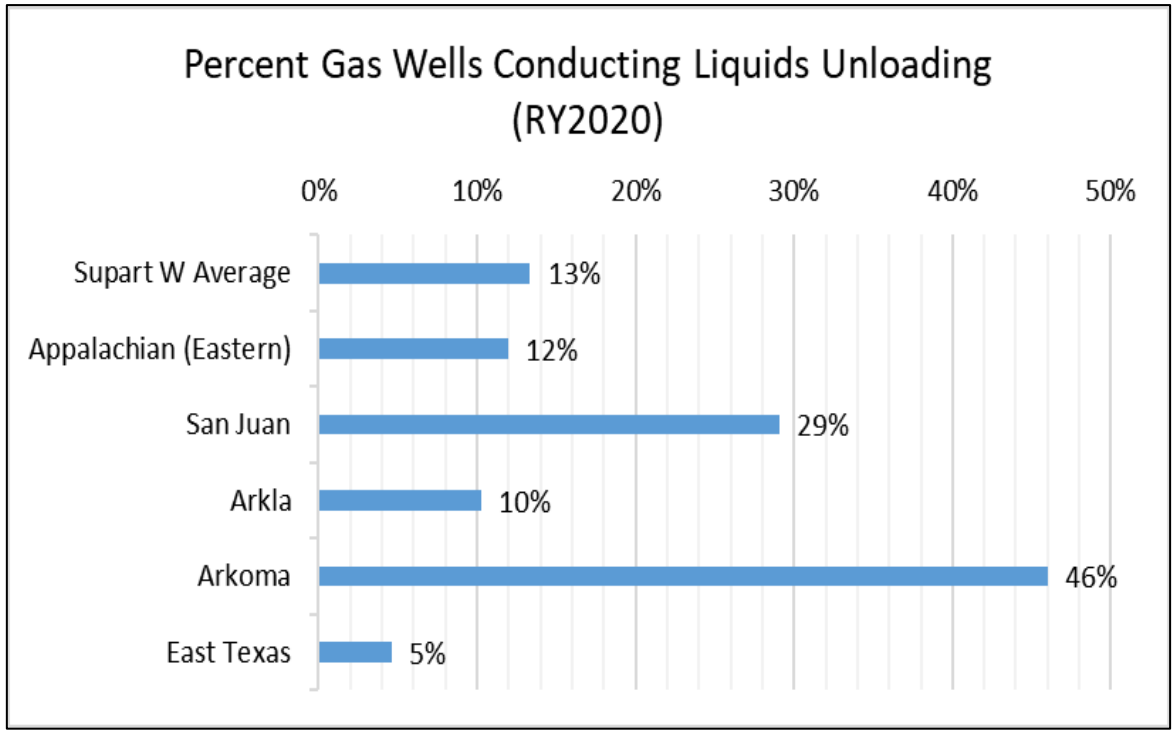
Production Update Overview

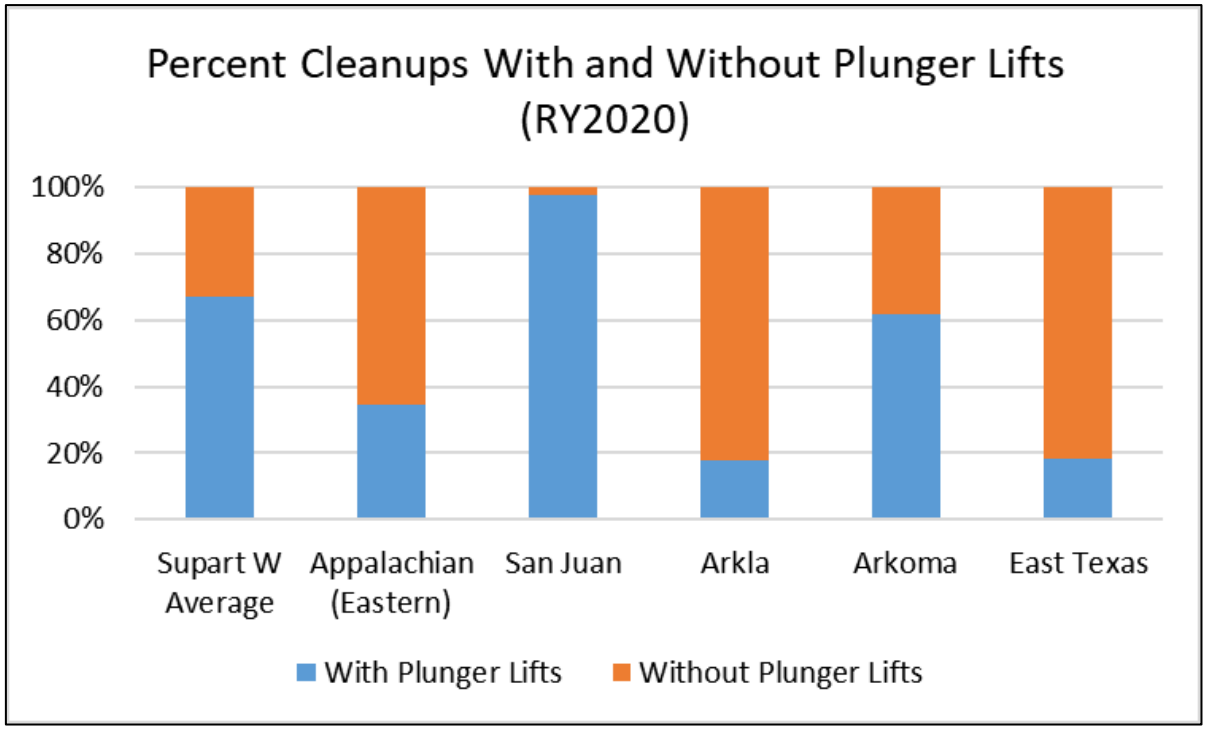
- Basin-Level Analyses Under Consideration for 2023 GHGI
  - Liquids Unloading
  - Pneumatic Controllers
  - Storage Tanks
  - Equipment Leaks

Liquids Unloading Basin-Level Analysis

- Current GHGI methodology:
  - Activity: Use of year-specific GHGRP data to calculate fraction of gas wells conducting unloading and venting, and fraction of well clean ups and vents with and without plungers
  - Emission Factor: Use of year-specific GHGRP emissions per well that vents in conducting
    - Liquids unloading with plunger lifts
    - Liquids unloading without plunger lifts
- Assessment of basin-level variability – Considered differences in both activity and emissions. *Variability in activity factors shown on next slide*.

Liquids Unloading Basin-Level Analysis – Variability –



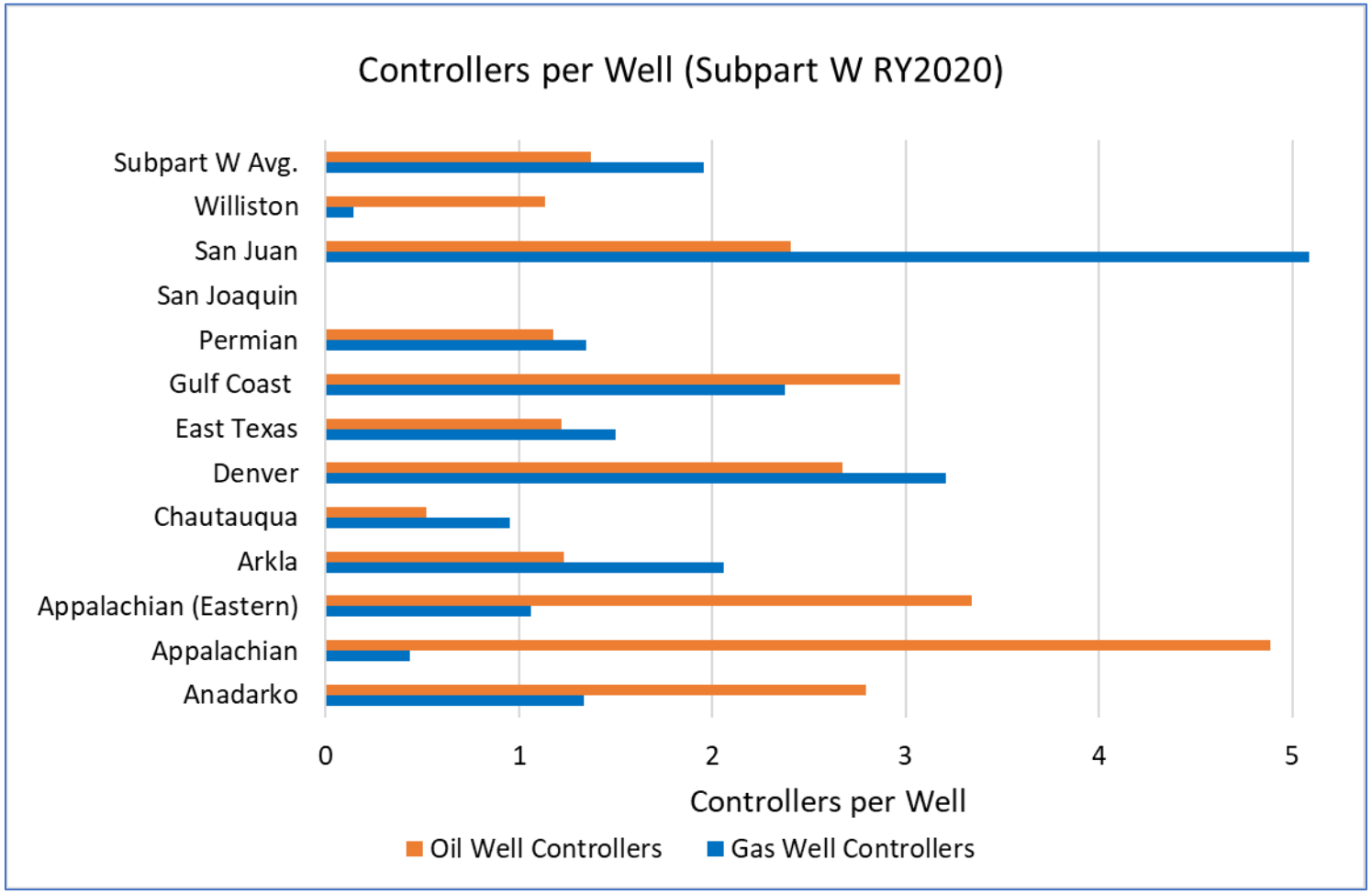


Pneumatic Controllers Basin-Level Analysis

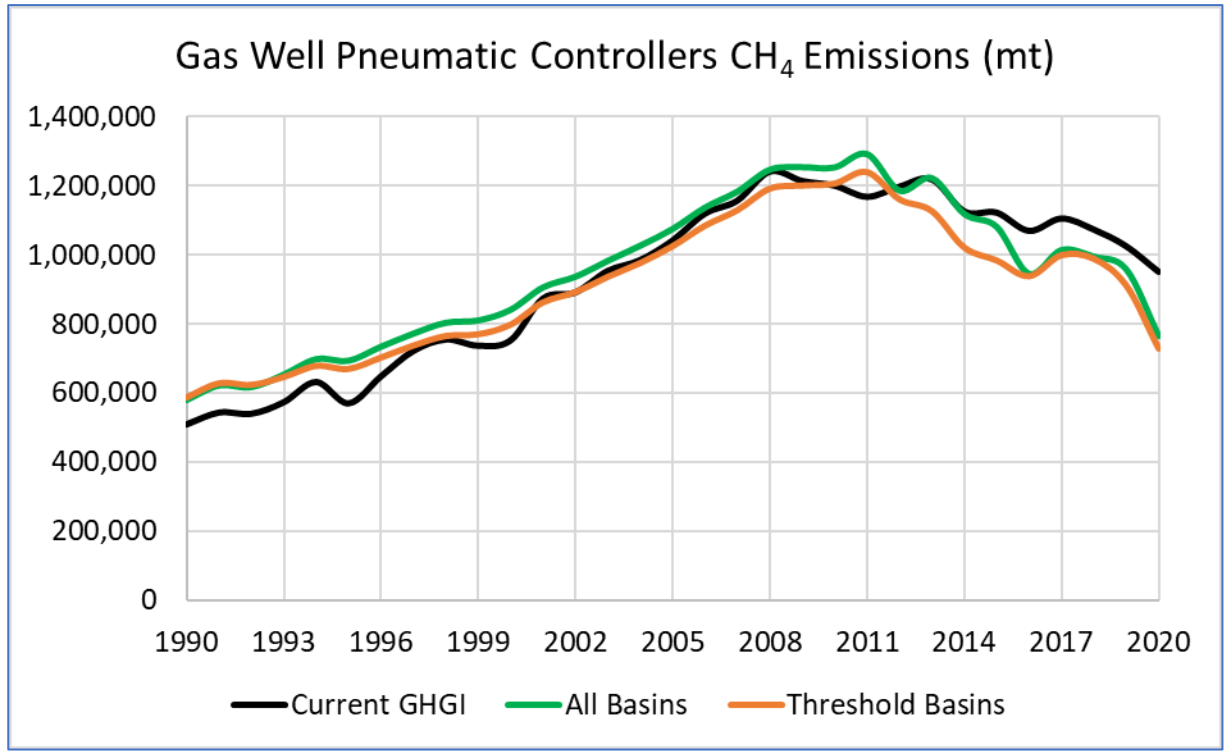
- Current GHGI methodology
  - Activity: Year-specific GHGRP data to calculate fractions of low, high, and intermittent bleed controllers and controllers per well (for 2011 forward)
    - Separate calculations are done for oil and gas well controllers
  - Emission Factor: Use of RY2014 GHGRP emissions per controller type
    - Same EFs applied for oil and gas well controllers
- Assessment of basin-level variability – Considered differences in both activity and emissions
- Emission factor update under consideration: Year-specific EFs unique to oil and gas well controllers

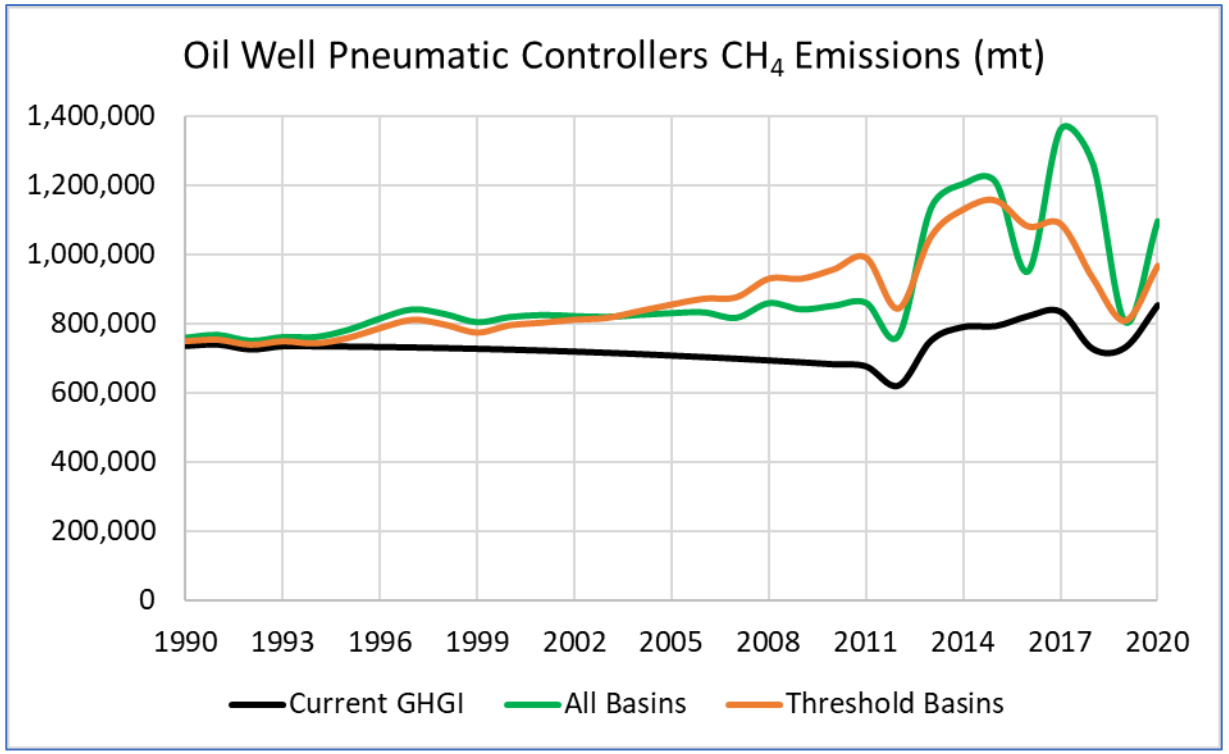
Pneumatic Controllers Basin-Level Analysis – Variability –

- Figure shows 12 basins with >20,000 wells (73% of total wells)
- Number of controllers per well shows significant variability across basins
  - e.g., far more controllers per well for gas wells in San Juan and oil wells in Appalachia
- This variability indicates basin-level calculations would take into account unique configurations of pneumatic controllers



Pneumatic Controllers Basin-Level Analysis – Impact on Calculated Emissions –





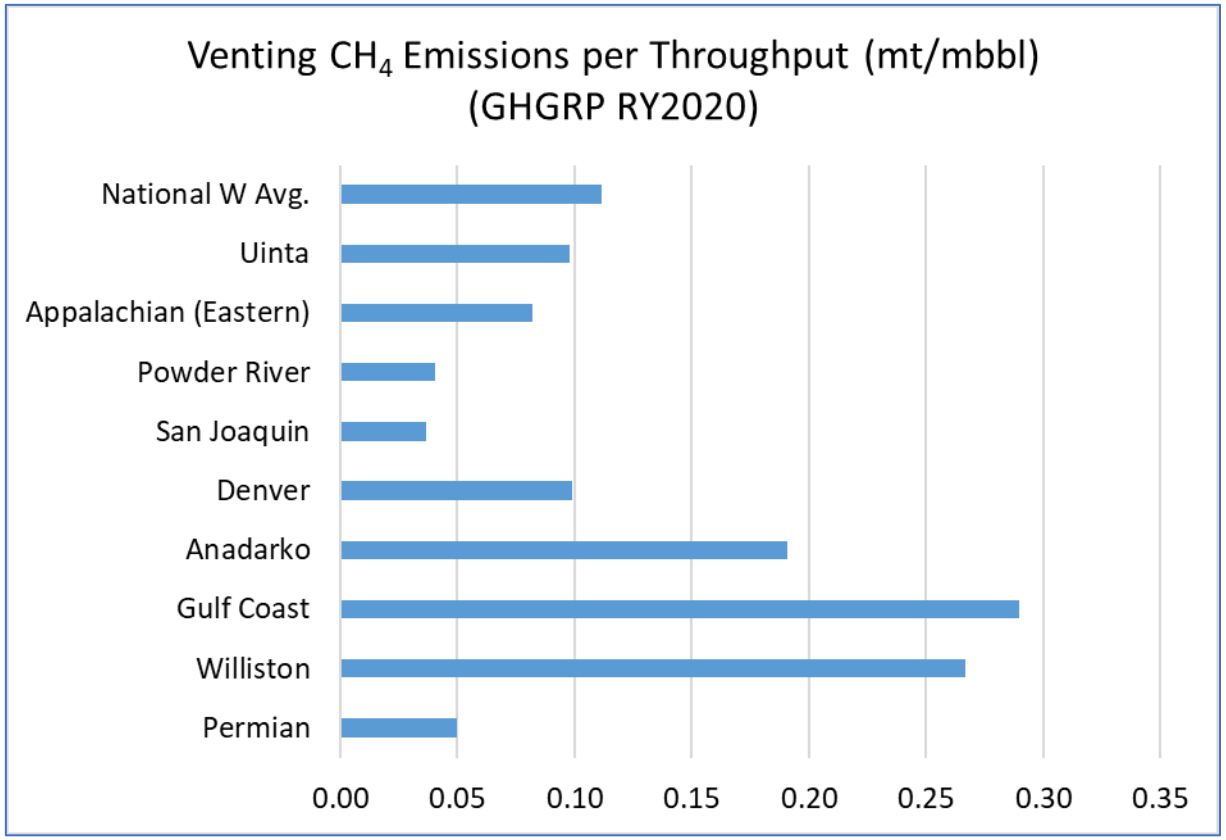
Compared to national, basin-specific calculations:

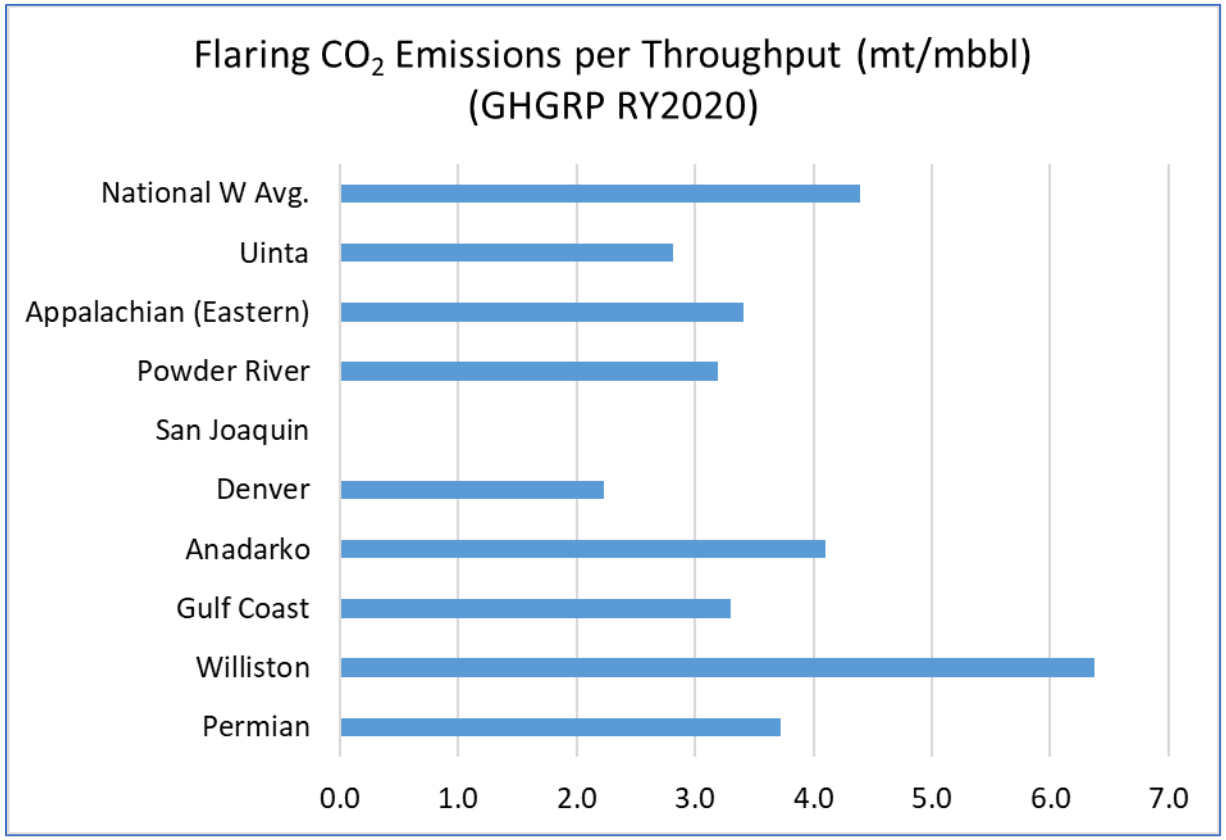
- Increase gas well controller emissions in early years
- Decrease gas well control emissions in recent years
- Increase oil well controller emissions across the time series

Storage Tanks Basin-Level Analysis

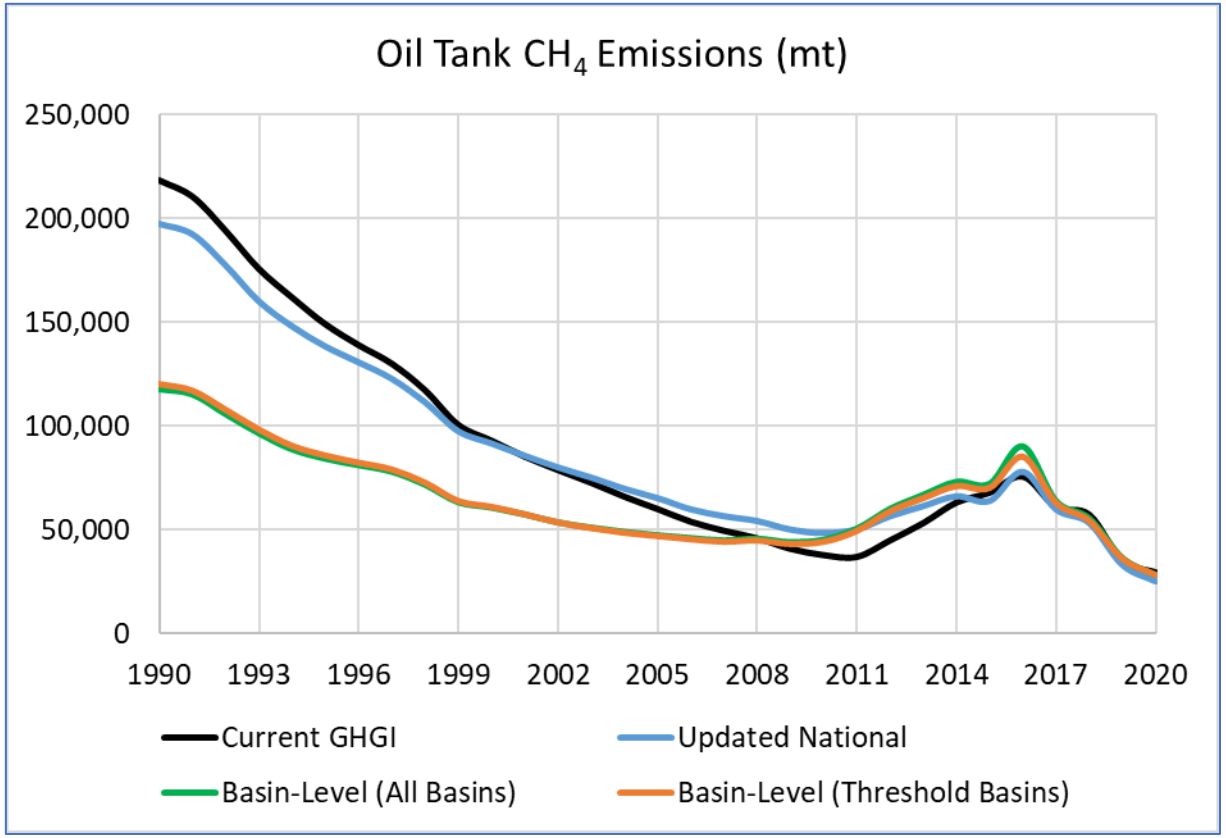
- Current GHGI methodology
  - Estimate emissions for 6 tank categories for oil and condensate tanks:
    - Large tanks with flares, large tanks with VRU, large tanks without controls
    - Small tanks with flares, small tanks without flares
    - Malfunctioning separator dump valves
  - Activity: GHGRP RY2015 % of condensate stored in condensate tanks and % of oil stored in oil tanks. Year-specific GHGRP data to calculate % of throughput sent to each tank category
  - Emission Factors: Year-specific GHGRP EFs for each tank category
- Assessment of basin-level variability: Considered differences in emissions
- Activity factor update under consideration: Year-specific % of liquids stored in tanks

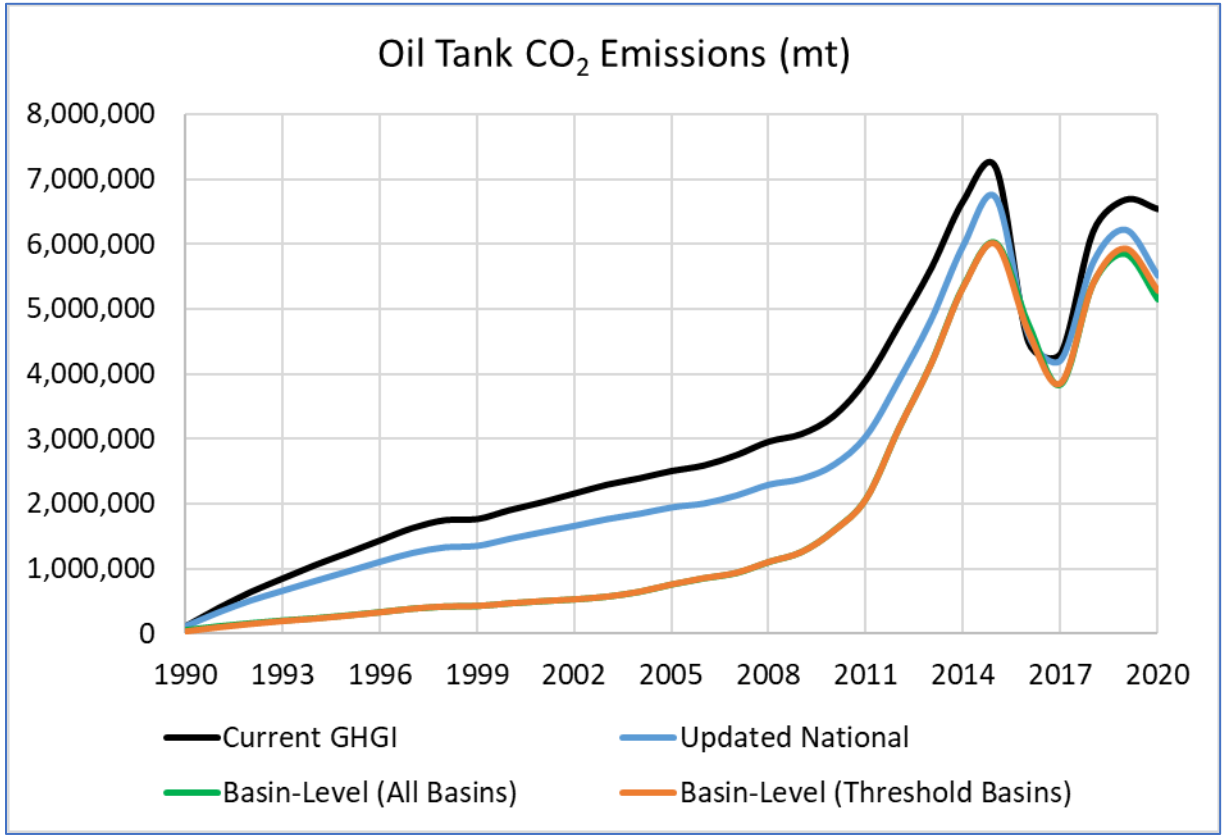
Storage Tanks Basin-Level Analysis – Variability –



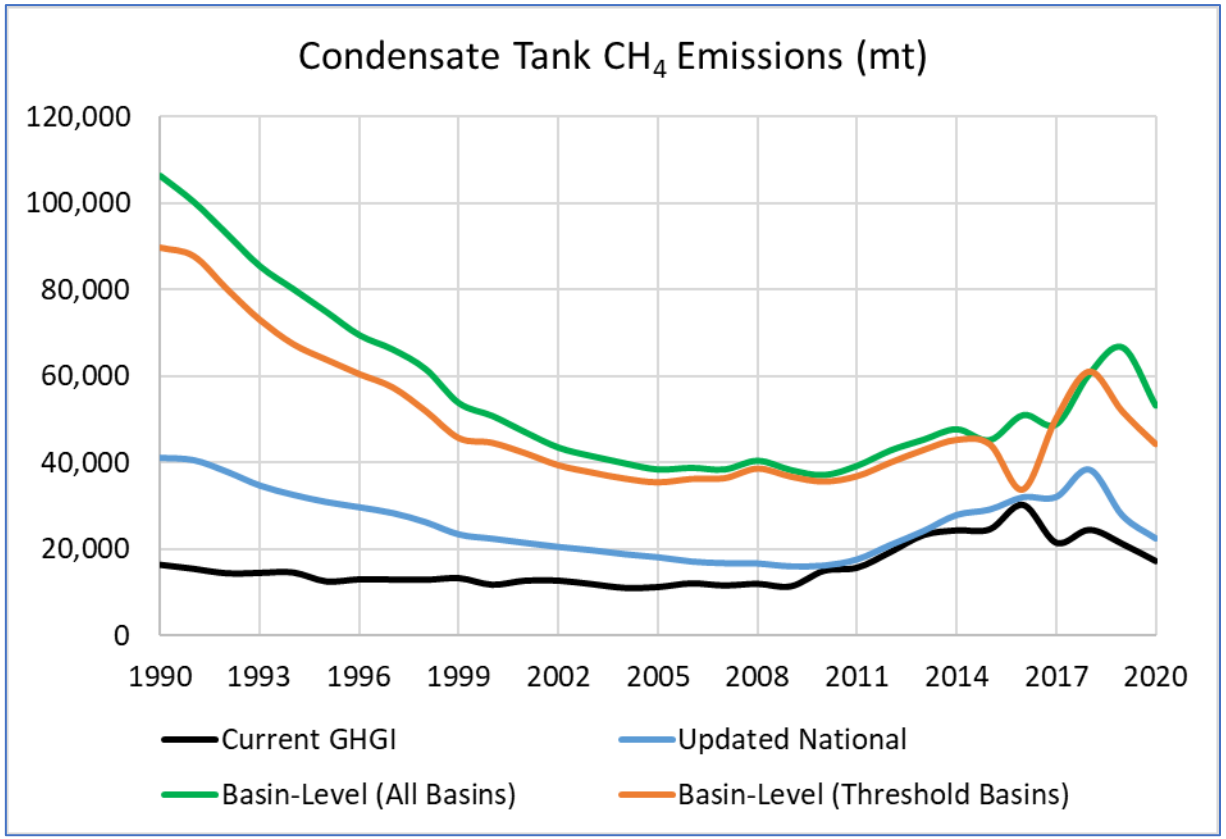


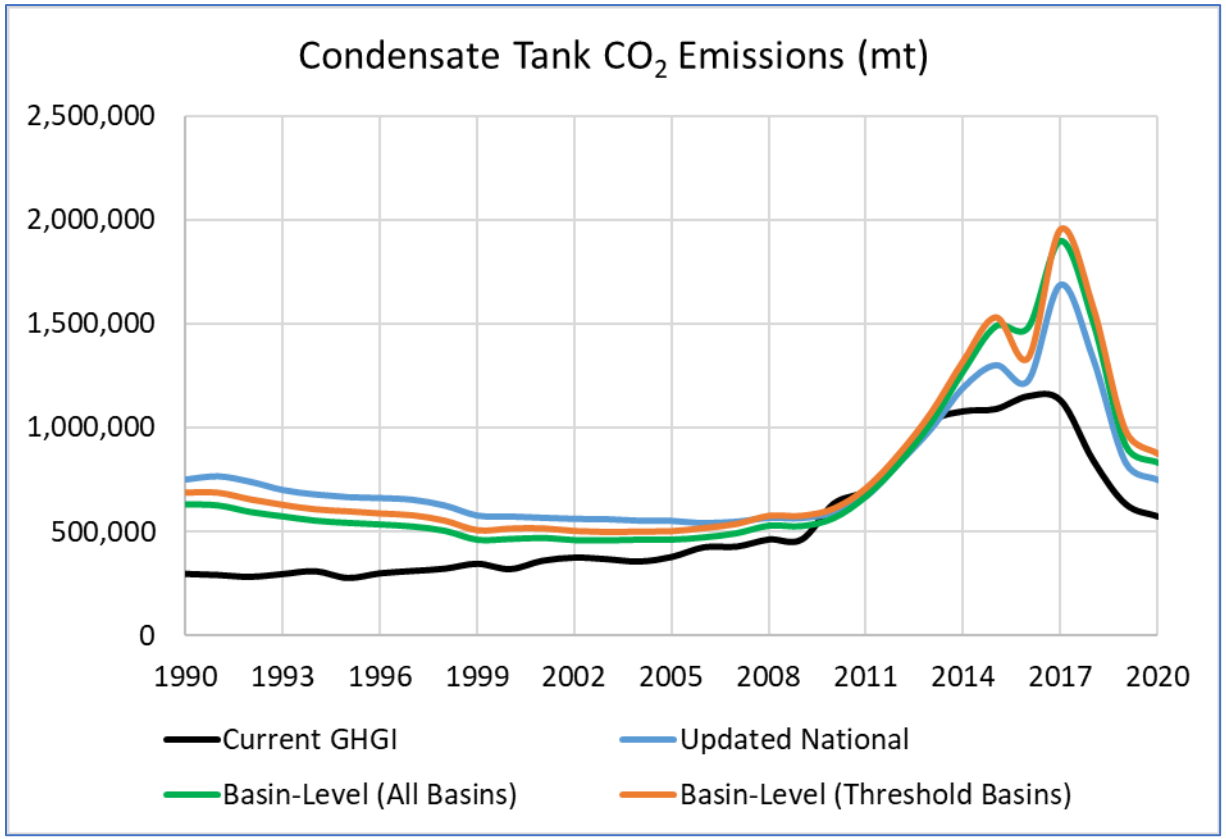
Storage Tanks Basin-Level Analysis – Impact on Emissions –





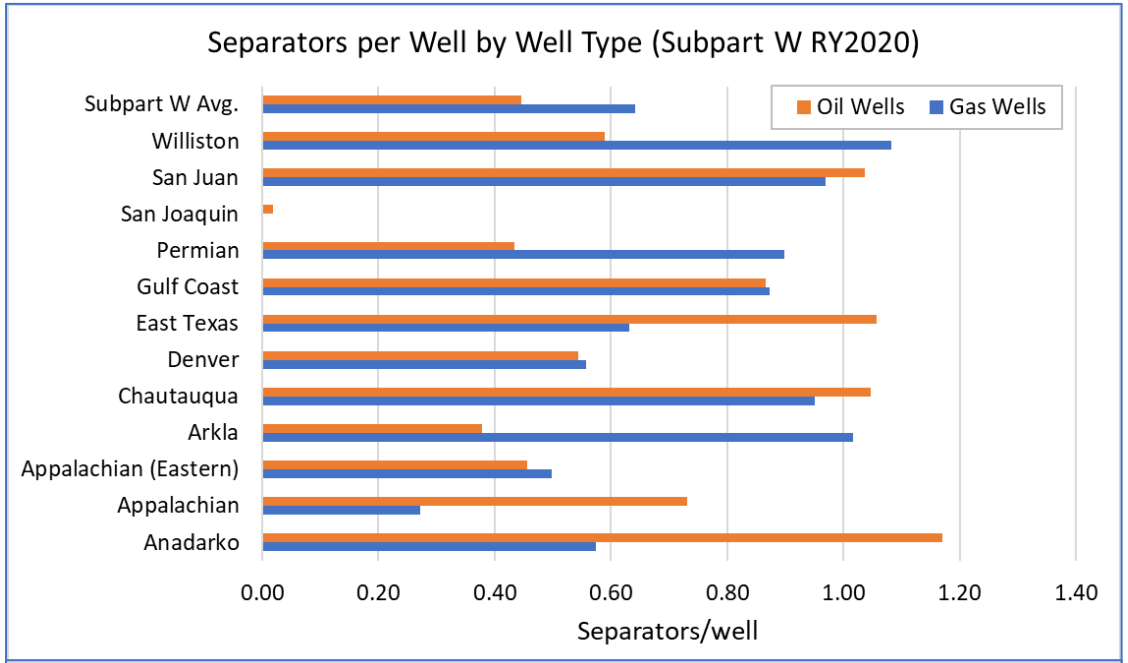
Storage Tanks Basin-Level Analysis – Impact on Emissions (cont.) –

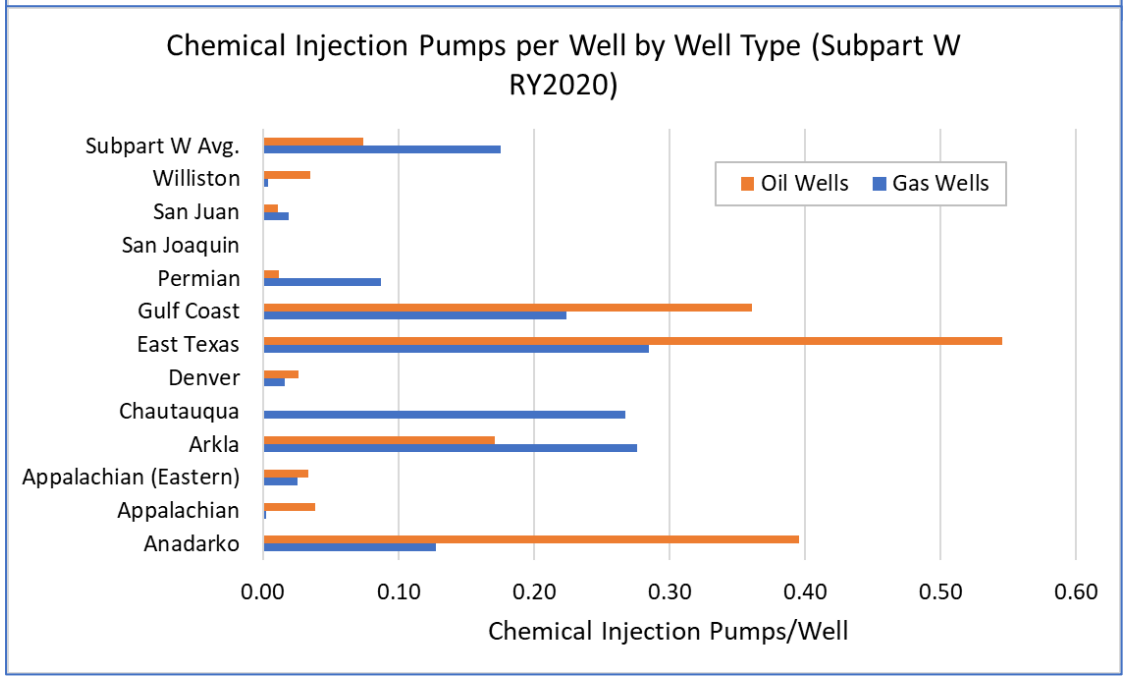




Equipment Leak Basin-Level Analysis – AF Variability

- Figures shows 12 basins with > 20,000 wells (73% of total wells)
- Equipment counts per well vary across basins and by well type
- This variability indicates basin-level calculations would take into account unique configurations of equipment





Next Steps and Stakeholder Feedback

Next Steps

- For 2023 GHGI, update under consideration is focusing on basin-level calculations for four production emission sources
  - Liquids unloading, pneumatic controllers, storage tanks, equipment leaks
- Will consider expanding to other production sources for future GHGIs
- Basin or state-level calculations for other industry segments will be continually evaluated moving forward
  - Would depend on identifying national datasets with relevant regional data

Requests for Stakeholder Feedback

- General feedback on the use of an approach that incorporates additional basin or state-level calculations
- Sources that might be prioritized for moving towards a basin-level approach
- Whether a coverage threshold should be considered
- Considerations for basins for which relatively few companies report data to GHGRP
- Approaches for basins with relatively low GHGRP coverage

Providing Stakeholder Feedback

- EPA memo posted online with additional details and specific stakeholder feedback requests
- https://www.epa.gov/ghgemissions/stakeholder-process-natural-gas-and-petroleum-systems-1990-2021-inventory
- Submit feedback via email: GHGInventory@epa.gov
- Public review draft available early 2023

- EPA is also seeking feedback on potential updates to improve characterization of CO2 transport, injection, and storage in the GHGI
  - Memo distributed with expert review draft of 2023 GHGI
  - For additional information, please contact GHGInventory@epa.gov

Inflation Reduction Act: Methane Emissions and Waste Reduction Incentive Program

Inflation Reduction Act provides new authorities under Clean Air Act Section 136 to reduce methane emissions from oil and gas operations

Financial and Technical Assistance

Allocates $1.55 billion to reduce methane emissions through financial assistance (grants, rebates, contracts, loans, and other activities) and technical assistance. Of this funding, $700 million is allocated specifically for activities at marginal conventional wells.

Use of funds can include:

- Preparing and submitting greenhouse gas reports.
- Monitoring methane emissions.
- Reducing methane and other greenhouse gas emissions (e.g., deploying equipment to reduce emissions, supporting innovation, shutting in and plugging wells, mitigating health effects in low-income and disadvantaged communities, improving climate resiliency, and supporting environmental restoration).

Funds are available until September 30, 2028.

Waste Emissions Charge

Establishes a waste emissions charge for methane from applicable facilities that report more than 25,000 metric tons of CO_2 equivalent per year to the Greenhouse Gas Reporting Program (GHGRP) and that exceed statutorily specified waste emissions thresholds.

- Covers upstream and midstream oil and gas facilities in the GHGRP.
- Waste emissions charge starts at $900 per metric ton in 2024 and increases to $1,500 in 2026.
- Includes certain exemptions and flexibilities related to the waste emissions charge.
- EPA directed to revise GHGRP regulations for petroleum and natural gas systems facilities (Subpart W) within 2 years to ensure that reporting is based on empirical data and accurately reflects total methane emissions.

Inflation Reduction Act: Methane Emissions and Waste Reduction Incentive Program

- EPA is seeking initial public input to ensure that implementation reflects broad stakeholder viewpoints.
- EPA has published a Request for Information (RFI) seeking public comment on core design aspects of the IRA Methane Emissions and Waste Reduction Incentive Program.
  - The Request for Information provides background information and questions for the public to consider as they provide their input.
  - EPA encourages all written feedback about the program to be submitted in response to the Request for Information.
- To provide comments, visit https://www.regulations.gov (Docket ID No. EPA-HQ-OAR-2022-0875).
  - Comments are requested by January 18, 2023.