Abandoned Wells Revision Under Consideration for the 2018 GHGI

Stakeholder Webinar

August 24, 2017

Overview

- Available data and preliminary CH_4 emissions estimates
- Requests for stakeholder feedback
- Summary of feedback received
- Next steps

Available Data and Preliminary CH_4 Emissions Estimates

Recent Direct Measurement Studies

- Kang et al. 2016
  - Additional measurements of 88 wells in Pennsylvania to fill data gaps from 2014 study of 19 wells
  - Significantly different emissions levels observed for: well type (gas versus oil or co-producing), plugging status (plugged versus unplugged), and coal area designation
- Townsend-Small et al. 2016
  - 138 wells in the Powder River Basin (WY), Denver-Julesburg Basin (CO), Uintah Basin (UT), and Appalachian Basin (OH)
  - Significantly different emissions levels observed for: plugging status (plugged versus unplugged), and eastern vs. western U.S.

Total Abandoned Wells Activity

- Approach 1: Use DrillingInfo data set to count number of wells existing but no longer reporting production as of [year].
  - Analyze LAST_PROD_DATE
- Approach 2: Use EIA or other data set to count cumulative number of wells drilled; subtract active wells as of [year].
  - EIA well drilling data not maintained after 2011
- For either approach, data sets are not historically complete (before mid-1900s).
  - EPA estimated that 1.2 million abandoned wells are not captured in the DrillingInfo-based approach, by analyzing year 1975 data from historical records.
  - EPA would add the 1.2 million well count to the DrillingInfo-based total to develop an accurate count of abandoned wells existing in each year of the time series.

Plugging Status Activity Factor

- If EPA uses separate EFs for plugged vs. unplugged status, a split between the two populations is needed for the 1990–2016 time series.
  - DrillingInfo provides a snapshot of the "status" of all wells. EPA provided an example wherein the data are interpreted to estimate 69% of wells (in the database, which excludes very old wells) are unplugged in 2016.
  - EPA might assume 100% unplugged status for wells in a certain early year—e.g., 1950—based on historical literature documenting effectiveness of plugging approaches over time (NPC 2011).
  - EPA might interpolate to develop plugged vs. unplugged split each year 1950–2016.

Preliminary Activity Data

Year	Abandoned Well Count (millions)			Plugging Status (%)	
	Total	Gas	Oil	Unplugged	Plugged
1990	2.35	0.32	2.04	81	19
1995	2.50	0.35	2.16	79	21
2000	2.65	0.37	2.28	77	23
2005	2.77	0.40	2.37	74	26
2010	2.89	0.44	2.45	72	28
2015	3.06	0.52	2.54	70	30
2016	3.12	0.55	2.57	69	31

Preliminary CH_4 Emissions Estimates

- National-level Townsend-Small EFs for plugged wells (0.002 g/hour/well) and unplugged wells (10.02 g/hour/well)
- DrillingInfo analysis for activity data (supplemented by historical data)
- Preliminary plugged/unplugged split approach
- Estimated CH_4 emissions (year 2015):

Source Category	CH_4 Emissions (MMT CO_2e)	% of Production Emissions*
Natural Gas	0.8	<1%
Petroleum	3.9	10%

*Presented for comparison purposes.

Requests for Stakeholder Feedback

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1. Are additional data sources available to estimate emission factors for abandoned wells?
2. What subcategories of abandoned wells should be represented in the GHGI (taking into account data availability and differences between emissions rates for subcategories)?
3. What additional data sources or methods are available to estimate the total population of wells abandoned prior to 1990 (considering that the production phase of many such wells likely pre-dates DrillingInfo coverage)?
4. What additional data sources are available, and what alternate methodologies might be appropriate, to estimate the total population of abandoned wells existing in each year of the time series (1990–2016)?
5. Additional data sources and methodologies to estimate the split between plugged and unplugged wells existing in each year of the time series (1990–2016)?

Requests for Stakeholder Feedback (Refer to EPA memo for details) – cont.

6. What year (e.g., 1950) might be appropriate to assume that zero percent of existing abandoned wells were effectively plugged (such an estimate would serve as a tie point for use in interpolation to develop plugged versus unplugged activity factors)?
7. Are there any additional ongoing or planned studies related to abandoned wells that could be used to refine future GHGIs?
8. Are data sources available to estimate emission factors for related derelict infrastructure (e.g., flow lines)?

Summary of Stakeholder Feedback

Next Steps

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1. Develop time series estimates using Townsend-Small 2016 national-level emission factors for plugged and unplugged wells
    - Broadest coverage data set available
    - Establishes two distinct subcategories, allowing GHGI to show changing practices over time
    - Would need to develop assumptions about regional level categorization to use more granular EFs
2. Use DrillingInfo database and estimate of wells not included in DrillingInfo to develop activity over the 1990-2016 time series
    - Fully document development of estimated ~1.2MM wells not captured in DrillingInfo-based analysis
3. Develop plugged vs. unplugged split over the time series based on analysis previously presented
    - Evaluate state orphaned wells programs
    - Note, using the DrillingInfo database to develop the year 2016 estimate of 31% plugged/69% unplugged should reflect the most recent available state data (e.g., orphaned well plugging programs) and likely over-estimates the plugged fraction because it excludes many historical wells not in the data set.
4. Review new emissions and activity data as it becomes available, and consider developing additional subcategories (e.g., state- or formation-specific).