Improvements to the Distribution Segment Methodology

EPA NATIONAL GREENHOUSE GAS INVENTORY WORKSHOP

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Key Takeaways from New Data

WSU/EDF Study

Mains

- Lower pipeline emissions compared to GHGI for most pipe types
- Result of improved leak surveys, pipeline replacement and maintenance, and improved emissions sampling techniques

Meter and Regulating Stations

- Significantly lower M&R station emissions compared to GHGI
- Result of equipment replacements/facility rebuilds, improved leak surveys, and modern station designs

GHGRP

Meter and Regulating Stations

- Significantly lower M&R station emissions compared to GHGI, based on actual LDC component count surveys rather than GHGI's default pressure-based emissions factors
- M&R station count based on actual number of facilities reported by LDCs, not based on gas throughput as is in GHGI, providing more accurate activity data

Comparison of Estimated Emission Factors

GRI/EPA Study

- Arithmetic average emissions of a small sample pool, and did not account for the distribution of "super emitters"

- Only 6 plastic mains were surveyed, including 1 super emitter.

- If the super emitter was excluded, the emissions factor for plastic pipe would be lower by nearly a factor of 5

WSU/EDF Study

- Stratified random sampling, improved measurement techniques, and sampled a larger number of known pipeline leaks, especially for plastic pipe.

- Advanced statistical analysis to estimate mean leak rates (SCFH/leak) that account for the distribution of super emitters
  - 1.3 percent of leaks (3 out of 230) accounted for 50 percent of total emissions from the measured pipeline leaks
  - Estimated mean leak rates were based on fitted probability models that use a skewed asymmetric probability distribution, as seen in the data

In estimating mean leak rates per mile of pipe, WSU/EDF also used updated data on the number of unrepaired leaks per mile, for the participating LDCs.

Mains and Services

Pipe Type	GRI/EPA Emissions Factor (g/min)	WSU Emission Factor (g/min)	Percent Change
Mains			
Cast Iron	3.57	0.90	-75%
Unprotected Steel	1.91	0.77	-60%
Protected Steel	0.76	1.21	59%
Plastic	1.88	0.33	-82%
Services			
Unprotected Steel	0.74	0.33	-55%
Protected Steel	0.34	0.13	-62%
Plastic	0.11	0.13	18%

When emissions factors derived from the study are scaled nationally, total U.S. distribution system emissions in 2011 are estimated by WSU to be 393 gigagrams (Gg) CH_4 (9.8 MMT CO_2e). This is 70 percent lower than EPA's estimate of 1,329 Gg CH_4 (33.2 MMT CO_2e) in the 2013 GHG Inventory.

M&R Stations

Pressure Category	GRI/EPA Emissions Factor (g/min)	WSU Emission Factor (g/min)	Percent Change
M&R Stations			
>300 psi	57.4	4.06	-93%
100-300 psi	30.5	1.88	-94%
<100 psi	1.4	not measured	-
Regulating Stations			
>300 psi	51.6	1.64	-97%
100-300 psi	12.9	0.27	-98%
40-100 psi	0.32	0.31	-3%
<40 psi	no EF	0.0	-
Vaults*	0.03-0.41	0.10	-76% to 233%

*All pressure categories are combined for underground vaults

The WSU study suggests the U.S. natural gas distribution system contributes less than 6 percent of total natural gas system methane emissions compared to the 19 percent contribution estimated by EPA in the 2013 GHG Inventory.

M&R Station Improvements

LDCS have upgraded M&R stations to improve safety, reduce costs, address odor complaints and noise issues.

Pneumatics

- Conversion of pneumatics from high bleed to low or no bleed using instrument air

Relief Valves

- Change from relief valves for over pressure protection to the use of closed systems that have two regulators in series (a monitor regulator and an operating regulator)

Metering

- Move from orifice metering to rotary, turbine and ultrasonic metering. This has resulted in reduced leaks from the orifice flange

Recommended Changes to Distribution Methodology

Mains

1. Update GHGI main emissions factors using WSU/EDF Study

2. Move from emission factors denoted as SCFY/Mile and activity factors of miles of pipe to emission factors of SCFY/leak, and activity factors of number of leaks based on LDC leak survey data

M&R Stations

1. Update GHGI M&R emissions factors using WSU/EDF Study

2. Use GHGRP M&R station activity data to update activity count/methodology

Future Considerations: GHRP, Methane Challenge and GHGI

GHGRP

- Once incorporated into GHGI, new emissions factors should be adopted by GHGRP

Methane Challenge Program

- Future Methane Challenge data could be used to improve estimates in GHGI
  - Blowdowns and excavation damages
  - Cast iron liners and inserts
  - Cast iron external and internal joint sealing
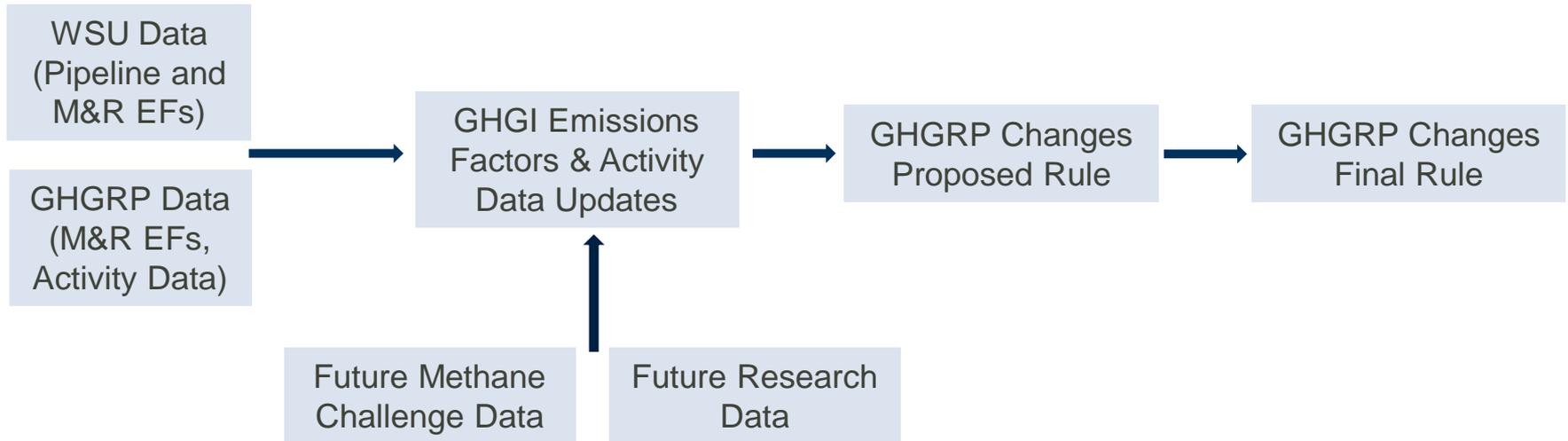
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