

Natural Gas Transmission and Storage in the 2016 GHGI

Overview of Potential
Methodology Updates

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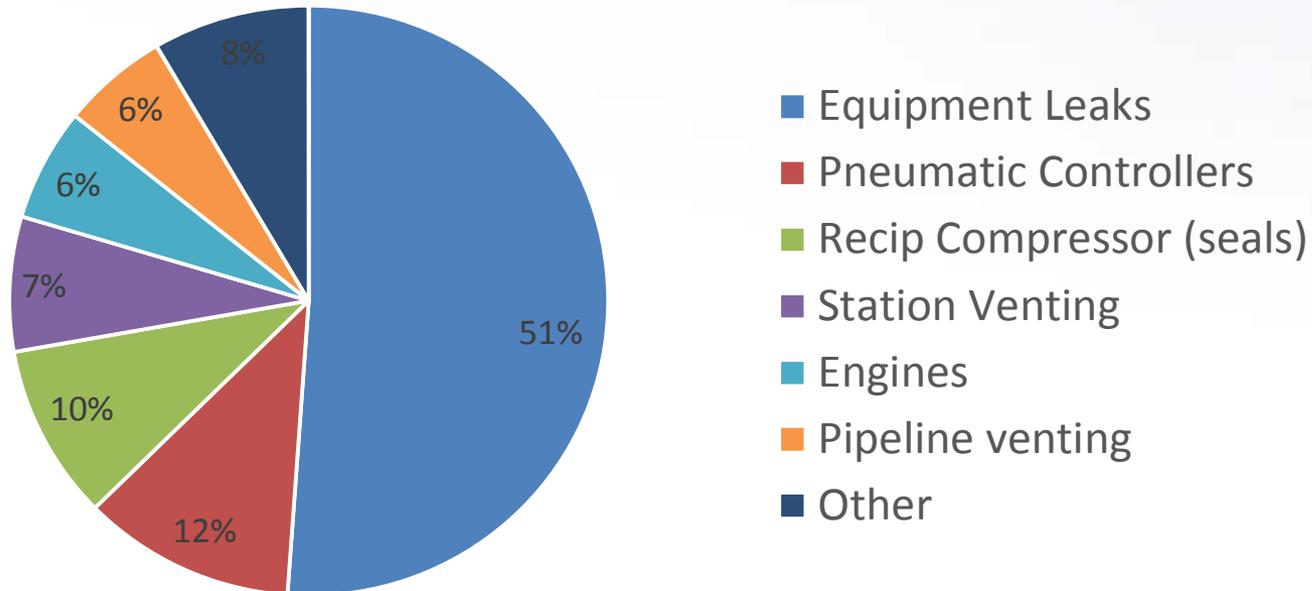


Transmission and Storage in 2015 GHGI



- 54.4 MMT CO₂e
- 35% of total natural gas systems methane emissions

2013 Transmission and Storage Emissions



Transmission and Storage Segment Emission Sources



- Fugitives
 - **Non-compressor station components**
 - **Compressor components**
 - Injection/withdrawal wellheads at storage sites
 - M&R stations
- Vented and combusted
 - **Pneumatic controllers**
 - Compressor station venting
 - Compressor exhaust
 - Pipeline venting
 - Dehydrator vents



Recent Data on Transmission and Storage Emissions

Emission Source	GHGRP Subpart W	Subramanian et al.	Zimmerle et al.	FERC	EIA
Compressor Station Non—compressor Component Fugitives	AD, EF	EF	AD, EF	AD	AD
Compressor Major Components ^a	AD, EF	EF	AD, EF	AD	-
Compressor Component Fugitives	AD, EF	EF	AD, EF	AD	-
Pneumatic Controllers	AD, EF	EF	AD, EF	-	-

*Leakage from seals, blowdown open-ended line valves, and isolation valves.

Stations and Compressors: Current Inventory Method



Activity Data

- ***Transmission Stations:*** Number of stations and compressors estimated in EPA/GRI (1996) study for base year 1992. Other years scaled from 1992 value based on PHMSA pipeline mileage relative to 1992.
- ***Storage Stations:*** Number of stations and compressors estimated in EPA/GRI (1996) study for base year 1992. Other years scaled from 1992 value based on EIA residential gas consumption relative to 1992.
- ***Centrifugal compressors*** separated by wet versus dry seals based on 2003 Gas STAR workshop data.

Stations and Compressors: Current Inventory Method (cont.)



Emission Factors

- Transmission Stations and Storage Station EFs for non-compressor station components and compressor components were developed in the EPA/GRI (1996) study.
- EFs are separated into station-level (non-compressor fugitives) and compressors (fugitives and leakage from major components: seals, blowdown OEL valves and isolation valves).
- Centrifugal compressor wet seal and dry seal EFs updated in 2010 using data from a World Gas Conference paper and a Gas STAR Lessons Learned report.

Stations and Compressors: Revisions Under Consideration



Activity Data

- ***Transmission Stations***

- Zimmerle et al. estimate of station and compressor counts for 2012; using PHMSA pipeline mileage to scale 2012 data to later years, and linear interpolation from 1992 to 2012 to estimate intermediate counts.
- Use wet versus dry seal centrifugal compressor proportions observed in subpart W data from each reporting year (and existing estimates for previous years).

- ***Storage Stations***

- Station Counts: Use Zimmerle et al. activity factor of 0.89 stations per active storage field (EIA storage field data available for 2005 and later). Apply linear interpolation from 1992 to 2005 to estimate intermediate counts.
- Compressor Counts: Use existing estimates for all years (Zimmerle et al. estimates are nearly identical).

Stations and Compressors: Revisions Under Consideration (cont.)



Emission Factors

- **Transmission Stations:** Use results of Zimmerle et al. for recent years (?-2014) and existing EFs for earlier years (1990– ?).
 - Zimmerle et al. station EF accounts for fugitives from non-compressor station components and compressor components (Connectors, Meters, OELs, PRVs, Valves, Tanks).
 - Zimmerle et al. compressor EFs only include major components (Seals, Blowdown OEL valves, Isolation valves), as other source emissions are included in station-level EF

Stations and Compressors: Revisions Under Consideration (cont.)



Emission Factors (cont.)

- **Storage Stations:** Use results of Zimmerle et al. for recent years (?-2014) and existing EFs for earlier years (1990– ?).
 - Zimmerle et al. compressor EF does not differentiate by compressor type (reciprocating versus centrifugal). The EF is based mostly on reciprocating compressor data, which is the dominant compressor type.
 - Zimmerle et al. station EF accounts for fugitives from non-compressor station components and compressor components (Connectors, Meters, OELs, PRVs, Valves, Tanks).
 - Zimmerle et al. compressor EF only includes major components (Seals, Blowdown OEL valves, Isolation valves).

Overview of Revisions Under Consideration for Stations and Compressors



Activity Data

Emission Source	2013 AD (# stations or # compressors)	
	2015 Inventory	Potential Revisions
Transmission Stations		
Compressor Stations	1,798	1,592
Reciprocating Compressors	7,227	4,032
Centrifugal Compressors - Wet Seals	659	673
Centrifugal Compressors - Dry Seals	66	990
Storage Stations		
Compressor Stations	407	357
Reciprocating Compressors	1,196	1,313
Centrifugal Compressors - Wet Seals	72	
Centrifugal Compressors - Dry Seals	45	

Overview of Revisions Under Consideration for Stations and Compressors (cont.)



Emission Factors

Emission Source	2013 EF (scfd/station or scfd/compressor)	
	2015 Inventory	Potential Revisions
Transmission Stations		
Compressor Stations	8,778	9,104*
Reciprocating Compressors	15,205	9,104**
Centrifugal Compressors - Wet Seals	50,222	9,673**
Centrifugal Compressors - Dry Seals	32,208	5,832**
Storage Stations		
Compressor Stations	21,507	10,100*
Reciprocating Compressors	21,116	9,957**
Centrifugal Compressors - Wet Seals	45,441	
Centrifugal Compressors - Dry Seals	31,989	

*EF includes non-compressor and compressor components.

**EF only includes compressor major components.

Pneumatic Controllers: Current Inventory Method



Activity Data

- EPA/GRI (1996) study estimate of 40 natural gas-driven pneumatic controllers per transmission or storage station

Emission Factor

- EPA/GRI (1996) study estimate of scfy/controller for a “generic controller” at transmission or storage stations.
 - Incorporates weighted average of observed bleed types and rates.

Pneumatic Controllers: Revisions Under Consideration



Activity Data and Emission Factors

- Use the Zimmerle et al. estimates for the number of controllers per station and EFs for recent years (?-2014) and existing estimates for early years (1990– ?).

or

- Use GHGRP estimates for number of controllers per station and to stratify estimate into high bleed, intermittent, and low bleed controllers. Use controller type-specific EF (e.g. GHGRP, Zimmerle input data)

Overview of Revisions under Consideration for Pneumatic Controllers



Emission Source & Segment	Activity Factor (# controllers per station)			EF (scfy CH4 / controller)		
	2015 Inventory	Potential Revision-Zimmerle	Potential Revision-GHGRP	2015 Inventory	Potential Revision-Zimmerle average factor	Potential Revision-GHGRP average factor
Controllers at Transmission Stations	40	25	26	162,197	51,921	33,370
Controllers at Storage Stations		84	62		109,034	64,042

Requests for Stakeholder Feedback



- Use of Subpart W activity data
 - Are data sources available that could be used to determine key characteristics of the non-reporting population?
- Non-Compressor and Compressor Component EFs for Transmission and Storage Stations
 - EPA is considering several options for station emissions, including using updated EF across the entire time series, or using current Inventory EF for earlier years of the time series and using more recent data in more recent years. Please comment on these approaches.
- Centrifugal Compressors at Transmission Stations
 - Can subpart W data on fraction of wet seal and dry seal compressors be used to represent this fraction for compressors nationally, or is the non-reporting population likely to have different characteristics? If so, how can these be reflected in the GHG Inventory?

Requests for Stakeholder Feedback (cont.)



- Pneumatic Controllers
 - EPA is considering several options for pneumatic controller AD, including using updated AD of pneumatic controllers per station across the entire time series, or using current Inventory AD for earlier years of the time series and using more recent data in more recent years. Please comment on these approaches.
 - EPA is considering several options for pneumatic controller EF, including using updated EF of pneumatic controllers per station across the entire time series, or using current Inventory EF for earlier years of the time series and using more recent data in more recent years. Please comment on these approaches.