

# **Natural Gas Processing**

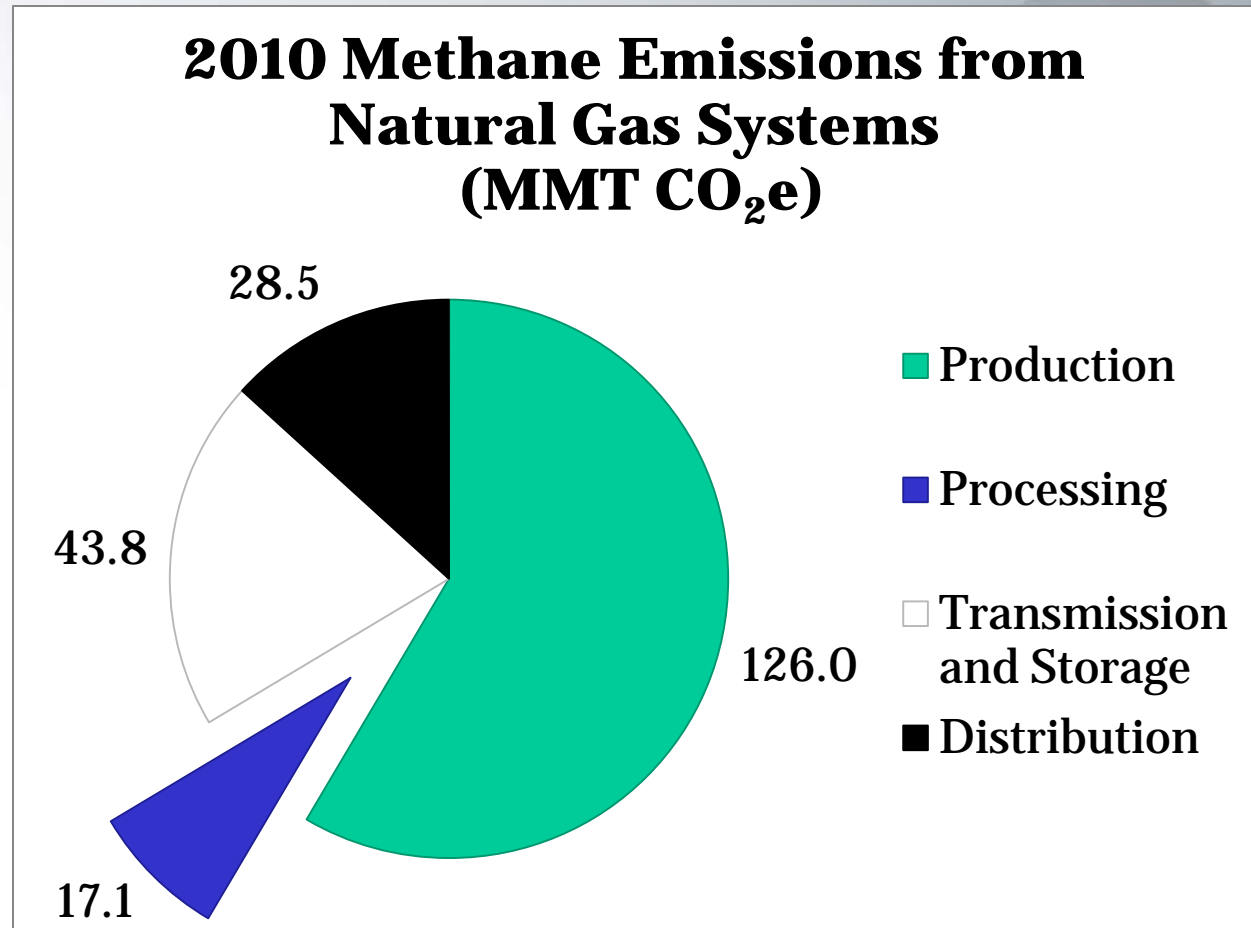
September 14, 2012



# Natural Gas Processing



- 17.1 MMT CO<sub>2</sub>e
- 7.9% of total natural gas systems emissions



# Background



Natural Gas Processing – Sources at processing plants, including fugitives, reciprocating compressors, centrifugal compressors, vented and combusted emissions (e.g., compressor exhaust, etc.) and maintenance venting.

## 2012 Inventory Natural Gas Processing Emissions (MMT CO<sub>2</sub>e)

	1990	1995	2000	2005	2010
<b>Calculated Potential</b>	17.9	18.3	18.4	17.3	20.1
<b>Voluntary Reductions</b>	+	-0.1	-0.3	-2.4	-2.7
<b>Regulatory Reductions</b>	+	+	-0.3	-0.3	-0.3
<b>Net Emissions</b>	18.0	18.1	17.8	14.6	17.1

+ = Does not exceed 0.05 MMT CO<sub>2</sub>e

# Natural Gas Processing Emission Sources

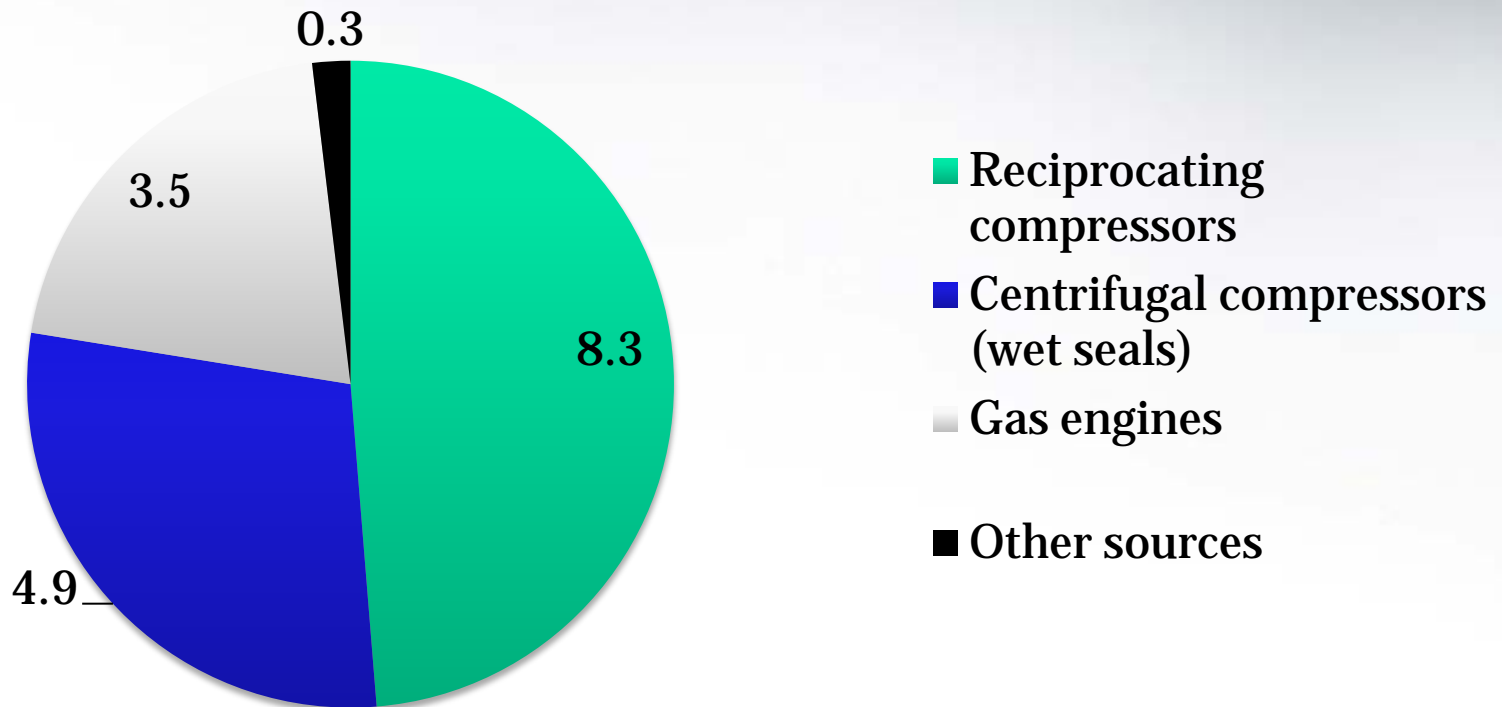


- 3 sources represent over 97% of natural gas processing emissions
  - **Reciprocating compressors**
  - **Centrifugal compressors (wet seals)**
  - **Gas engines**
- Other sources
  - Plant fugitives
  - Centrifugal compressors (dry seals)
  - Gas turbines
  - Acid gas removal (AGR) vents
  - Kimray pumps
  - Dehydrator vents
  - Pneumatic devices
  - Blowdowns/venting

# Natural Gas Processing Emissions



2010 Methane Emissions (2012 Inventory), MMT CO<sub>2</sub>e



# General Methodology Overview



## **Step 1. Calculate potential methane**

- 1a – Activity Data
- 1b – Emission Factor

## **Step 2. Compile reductions data**

- 2a – Voluntary Reductions Reported to GasStar
- 2b – Regulatory Reductions

## **Step 3. Calculate Net Emissions**

# Reciprocating Compressors



*Includes methane emissions from reciprocating compressor blowdown open-ended lines, pressure relief valves, starter open-ended lines, and rod packing seals*

## Step 1. Calculate Potential Methane

- Activity Data is number of reciprocating compressors for given year – 1992 value (EPA/GRI 1996) scaled linearly from 1992 to 2010 with dry gas production

$$AD_{2010} = \# \text{ of Recip Comp}_{1992} \times (\text{Gas Prod}_{2010} / \text{Gas Prod}_{1992})$$

- Emission factor is 11,196 scfd/year-compressor from EPA/GRI (1996)

## Step 2. Compile Reductions Data

– Future Inventories--NSPS

## Step 3. Calculate Net Emissions

2010 Emissions (2012 Inventory), MMT CO<sub>2</sub>e

Activity data (Compressors)	Emissions Factor (scf per compressor)	Emissions (MMT CO <sub>2</sub> e)
5,028	× 11,196	= 8.3

# Centrifugal Compressors (Wet Seal)



*Wet seals use oil seals around the rotating shaft to prevent natural gas from escaping where the compressor shaft exits the compressor casing*

## Step 1. Calculate Potential Methane

- Activity Data is number of centrifugal compressors with wet seals for given year – 1992 value (EPA/GRI 1996) scaled linearly from 1992 to 2010 with dry gas production minus # of centrifugal compressors with dry seals

$$AD_{2010} = \# \text{ of CentCompWS}_{1992} \times (\text{Gas Prod}_{2010} / \text{Gas Prod}_{1992}) - \# \text{ of CentCompDS}_{2010}$$

- Emission factor is 51,369 scfd/year-compressor

## Step 2. Compile Reductions Data

- Future Inventories—NSPS

## Step 3. Calculate Net Emissions

2010 Emissions (2012 Inventory), MMT CO<sub>2</sub>e

Activity data (Compressors)	Emissions Factor (scf per compressor)	Emissions (MMT CO <sub>2</sub> e)
672	× 51,369	= 4.9



# Gas Engines



*Internal combustion engines fueled by natural gas which serve as the driving force for reciprocating compressors*

## Step 1. Calculate Potential Methane

- Activity Data is number of horsepower-hours for given year – scaled linearly from 1992 to 2010 with dry gas production

$$AD_{2010} = MMHP_{hr1992} \times (\text{Gas Prod}_{2010} / \text{Gas Prod}_{1992})$$

- Emission factor is 0.24 scf/horsepower-hour from EPA/GRI (1996)

## Step 2. Compile Reductions Data

- N/A

## Step 3. Calculate Net Emissions

2010 Emissions (2012 Inventory), MMT CO<sub>2</sub>e

Activity data (MMHP-hr)	Emissions Factor (scf per HP-hour)	Emissions (MMT CO <sub>2</sub> e)
36,124	× 0.24	= 3.5

# Calculating Net Emissions Processing



- Voluntary reduction activities include:
  - Directed inspection and maintenance at processing plants
  - Improve measurement systems to track gas loss
  - DI&M aerial leak detection using laser and/or infrared technology
  - Install flash tank separators on glycol dehydrators
  - Eliminate unnecessary equipment and/or systems
  - Optimize nitrogen rejection unit to reduce methane in N<sub>2</sub> reject stream
- Regulatory reduction activities include:
  - NESHAP in dehydrating vents
  - Future Inventories--NSPS

2010 Emissions from Processing (2012 Inventory), MMT CO<sub>2</sub>e

Calculated Potential	Voluntary Reductions	Regulatory Reductions	Emissions (MMT CO <sub>2</sub> e)
20.1	-2.7	- 0.3	= 17.1

# Questions for Stakeholders



- Are more recent data sources available?
  - Activity data
  - Emission factors
  - Drivers
- Suggestions for updates to presentation of processing sector information in the GHG Inventory?