

# Barriers to Implementation of Methane Emissions Reduction Projects in Gas Transmission and Distribution



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# Agenda

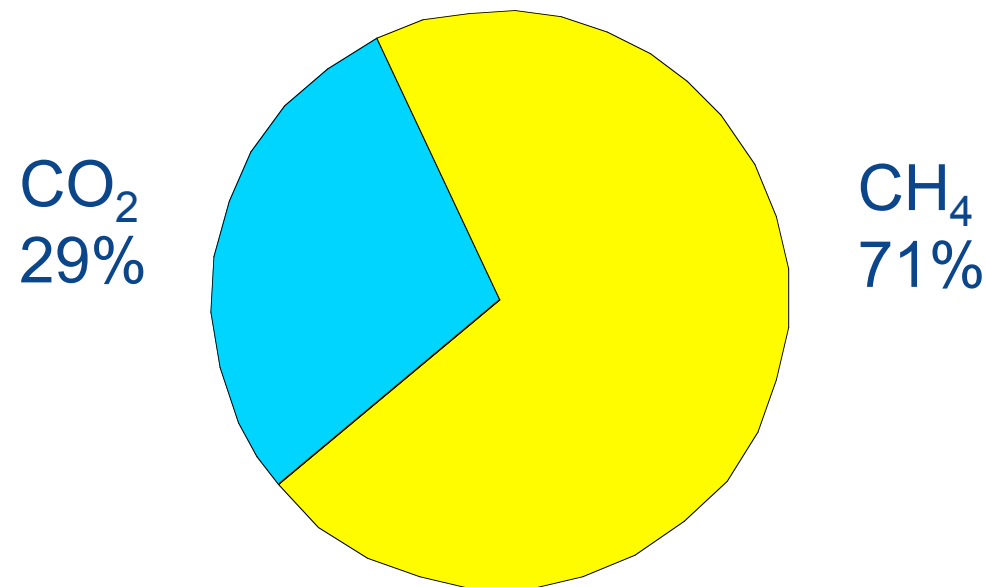
- 🔥 Why Focus on Methane?
- 🔥 U.S. Greenhouse Gas Emissions
  - 🔥 Transmission and Distribution Sector Methane Emissions
- 🔥 Methane Emissions Reduction Technologies and Practices
  - 🔥 Leak Detection and Measurement
  - 🔥 Transmission Sector
  - 🔥 Distribution Sector
- 🔥 Barriers to Implementation
  - 🔥 Transmission
  - 🔥 Distribution
- 🔥 Conclusions

# Why Focus on Methane?

- 🔥 A potent greenhouse gas (GHG) with atmospheric lifetime of ~12 years
  - 🔥 100-year Global Warming Potential (GWP) of 25<sup>1</sup>
  - 🔥 20-year GWP of 72<sup>1</sup>
- 🔥 A primary component of natural gas and a valuable, clean-burning energy source
  - 🔥 Proven, viable technologies and practices exist to reduce methane emissions cost-effectively
- 🔥 Methane emissions from oil and natural gas operations are a significant source of total U.S. GHG emissions (over 5%) on a 20-year GWP basis
- 🔥 Reducing methane emissions increases the amount of usable fuel in the U.S.

## U.S. Natural Gas Industry GHG Emissions: 20 year Global Warming Potential Basis

- 🔥 Methane emissions comprise 71% of total U.S. Natural Gas industry GHG emissions



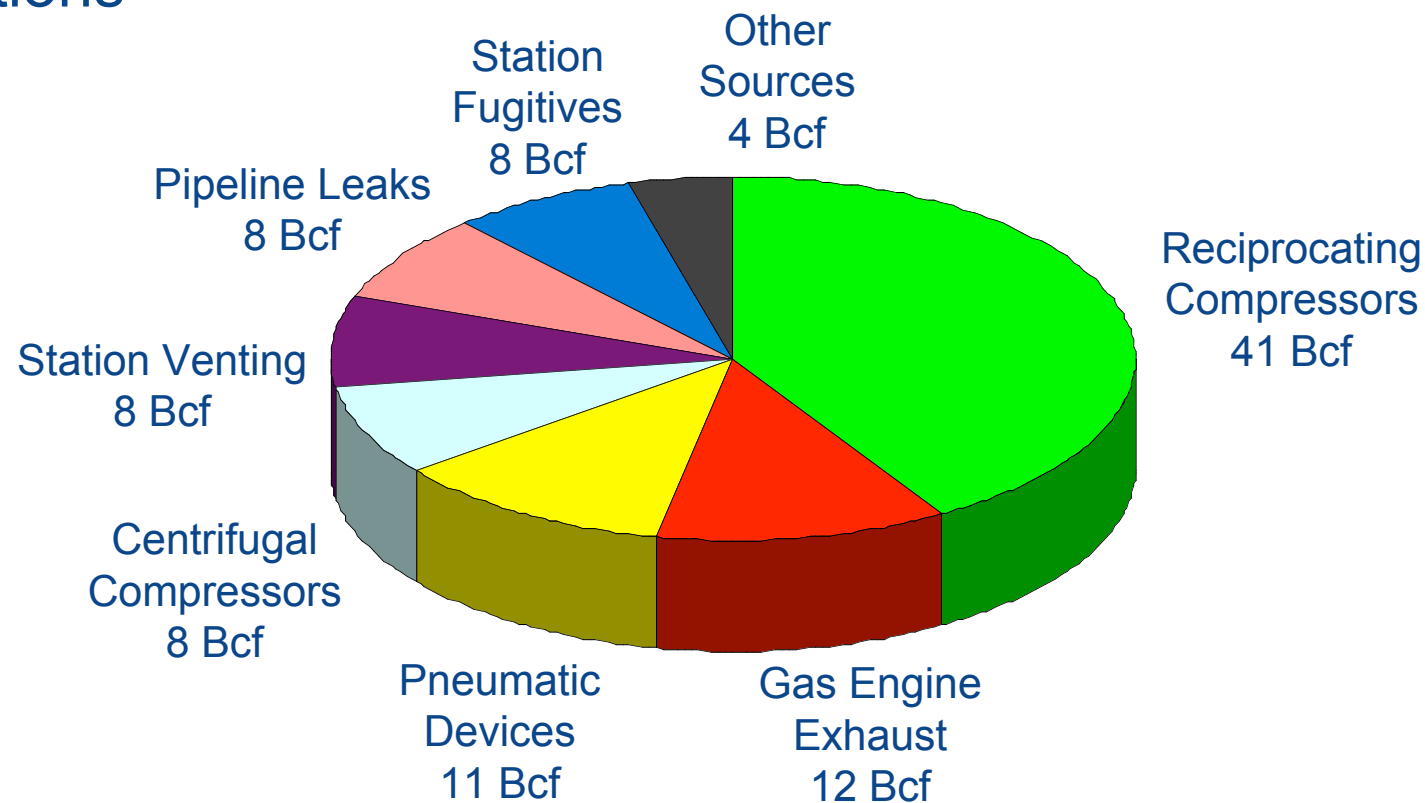
N<sub>2</sub>O Emissions are negligible

EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2007*. April, 2009.

Updated with 20-year GWP from IPCC. *Changes in Atmospheric Constituents and in Radiative Forcing*. 2007.

## 2007 Transmission Sector Methane Emissions

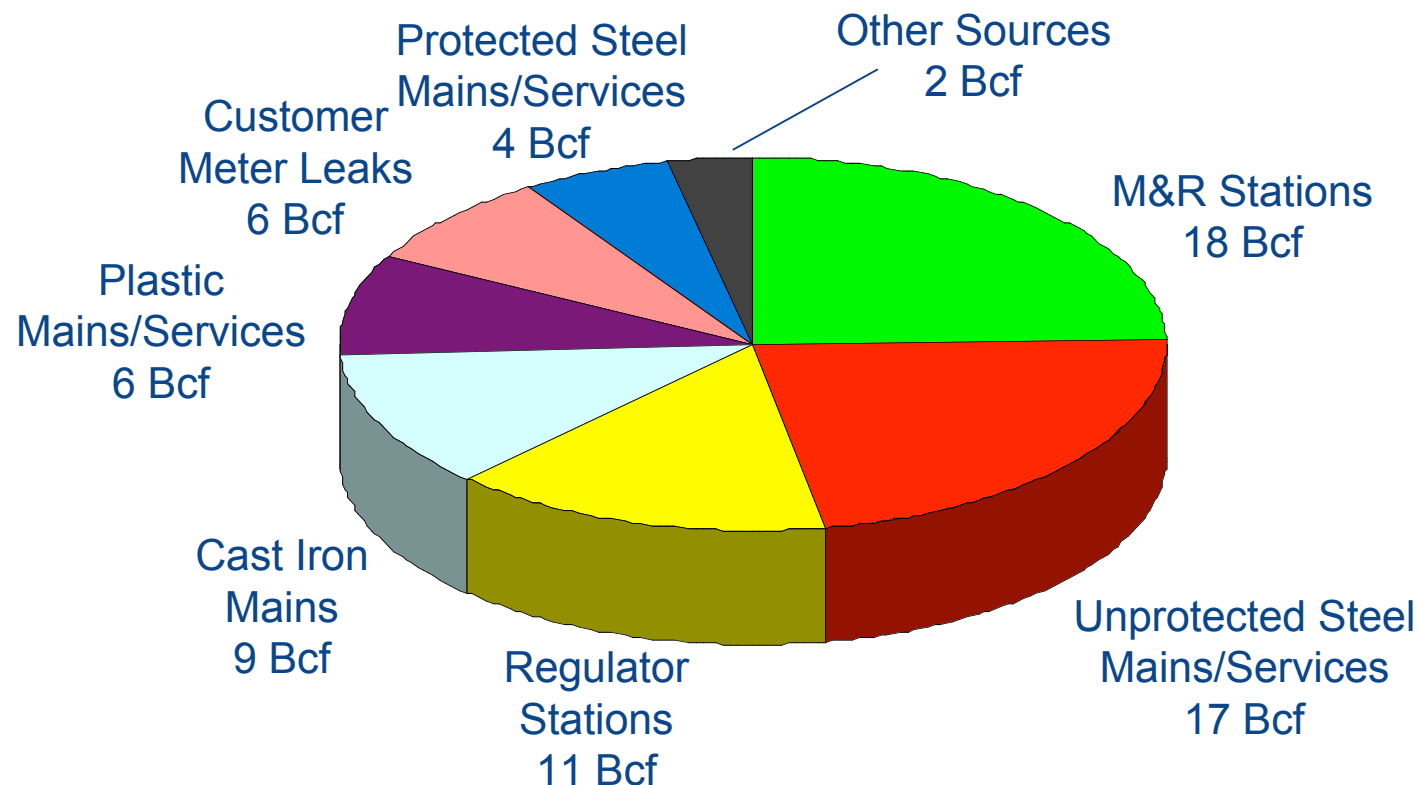
- Majority of emissions from fugitives and venting at compressor stations



EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2007*. April, 2009. Available on the web at: [epa.gov/climatechange/emissions/usinventoryreport.html](http://epa.gov/climatechange/emissions/usinventoryreport.html)

## 2007 Distribution Sector Methane Emissions

- Majority of emissions from underground pipe leaks and fugitives from metering and regulator stations



EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2007*. April, 2009. Available on the web at: [epa.gov/climatechange/emissions/usinventoryreport.html](http://epa.gov/climatechange/emissions/usinventoryreport.html)

## Technologies Exist Today to:

- 🔥 Detect methane emissions
- 🔥 Measure methane emission
- 🔥 Reduce methane emissions
  
- 🔥 Primary barrier to reducing methane emissions in gas transmission and distribution is policy, not technology.



# Leak Detection Technologies

- 🔥 Screening - find the leaks
  - 🔥 Soap bubble screening
  - 🔥 Electronic screening (“sniffer”)
  - 🔥 Toxic vapor analyzer (TVA)
  - 🔥 Organic vapor analyzer (OVA)
  - 🔥 Ultrasound leak detection
  - 🔥 Acoustic leak detection
  - 🔥 Infrared leak detection

Leak Imaging Camera



Acoustic Leak Detection



# Measurement Technologies

- 🔥 Evaluate the leaks detected - measure results
  - 🔥 High volume sampler
  - 🔥 Toxic vapor analyzer (correlation factors)
  - 🔥 Rotameters/Anemometers
  - 🔥 Calibrated bagging

Leak Measurement Using High Volume Sampler



# Transmission Sector

## Methane Emissions Reduction Technologies

- 🔥 Natural Gas STAR Partners have reported utilizing a number of technologies and practices to reduce methane emissions
  - 🔥 Economic rod packing replacement in reciprocating compressors
  - 🔥 Air/fuel ratio controls on compressors
  - 🔥 Replace high-bleed pneumatics with low-bleed pneumatic devices
  - 🔥 Replace wet seals with dry seals in centrifugal compressors
  - 🔥 Infrared leak detection devices
    - 🔥 Hand-held
    - 🔥 Aerial
  - 🔥 Hot taps
  - 🔥 Composite wrap

# Distribution Sector Methane Emissions Reduction Technologies

- 🔥 Natural Gas STAR Partners have reported utilizing a number of emission reduction technologies including
  - 🔥 Identification and replacement of leaky distribution pipe
  - 🔥 Infrared leak detection devices
  - 🔥 Flexible plastic inserts for cast iron mains
  - 🔥 Seam-sealing robot for cast iron mains
  - 🔥 Automated control systems for reducing distribution system pressure
    - 🔥 smart regulators
    - 🔥 clocking solenoids

## Partner Experience - Northern Natural Gas

- 🔥 *Detection* - Screened 659 rod packings with IR camera to identify leaks
- 🔥 *Measurement* - High volume sampler, Rotameter, and Mueller utilized to measure leaks
- 🔥 Leak rates ranged as high as 3,155 Mcf/yr
- 🔥 *Reduction Technology/Practice* - Regular monitoring and economic replacement keeps rod packing emissions low
- 🔥 Annual savings of 71MMcf in 2006 by replacing compressor rod packing



Source: Northern Natural Gas

## DI&M - Aerial Leak Surveys

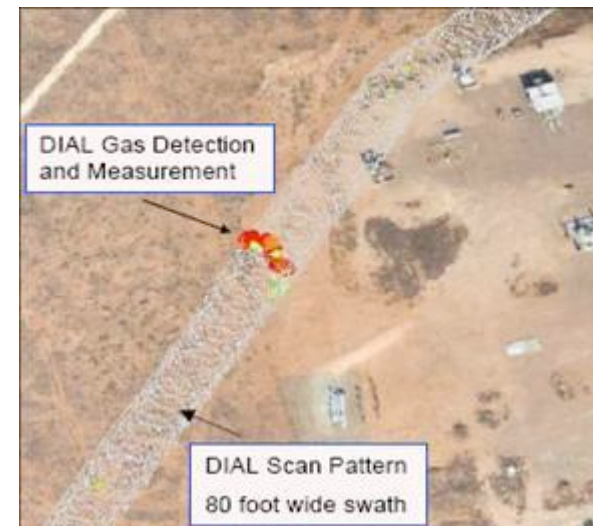
- 🔥 Aerial leak surveys with infrared leak detection devices can aid in leak identification over large sections of pipelines
- 🔥 Aerial surveys can be conducted in helicopters or fixed wing aircrafts using both active and passive IR detection devices



Source: LaSen Inc.

## Partner Experience - Northern Natural Gas

- 🔥 1,183 miles of pipeline surveyed using ITT ANGEL Service (Airborne Natural Gas Emission Lidar) with
- 🔥 Data collection time: 13.4 hours
- 🔥 Differential Absorption LIDAR (DIAL) laser technology provides accurate leak detection
- 🔥 Color digital geospatial video of rights-of-way and surrounding areas
- 🔥 Datasets show complete pipeline leak survey coverage
- 🔥 Leaks found and verified in 27 locations



Source: Northern Natural Gas

## Partner Experience - Northern Natural Gas

- 🔥 Underground leak detected by DIAL, Kansas



Source: Northern Natural Gas



# *Technology / Practice Highlights*

## **Plastic Inserts for Cast Iron Mains**

- 🔥 Cured in Place Liners
  - 🔥 Starline
    - 🔥 Surface preparation / Pipe cleaning
    - 🔥 Adhesive Mixing
    - 🔥 Liner wet-out / Adhesive application
    - 🔥 Liner Inversion
- 🔥 Tight Fit Polyethylene
  - 🔥 Rolldown
    - 🔥 Size for Size Insertion
    - 🔥 Reduction of Capacity
  - 🔥 Subline
    - 🔥 Size for Size
    - 🔥 Minimal Reduction of Capacity

## *Technology / Practice Highlights - cont.*

# Cast Iron Seam-Sealing Robot (CISBOT)

- 🔥 ConEd has reported using CISBOT to seal joints in live cast iron mains between 6 – 12 inches in diameter
- 🔥 CISBOT can seal joints in up to 300 feet of pipeline through a single excavation (150 feet in each direction from launching pit)
- 🔥 Equipped with:
  - 🔥 Video camera
  - 🔥 Pointer lights
  - 🔥 Support arms
  - 🔥 Drill head
  - 🔥 Sealant injector
- 🔥 Uses anaerobic sealant for long term repairs

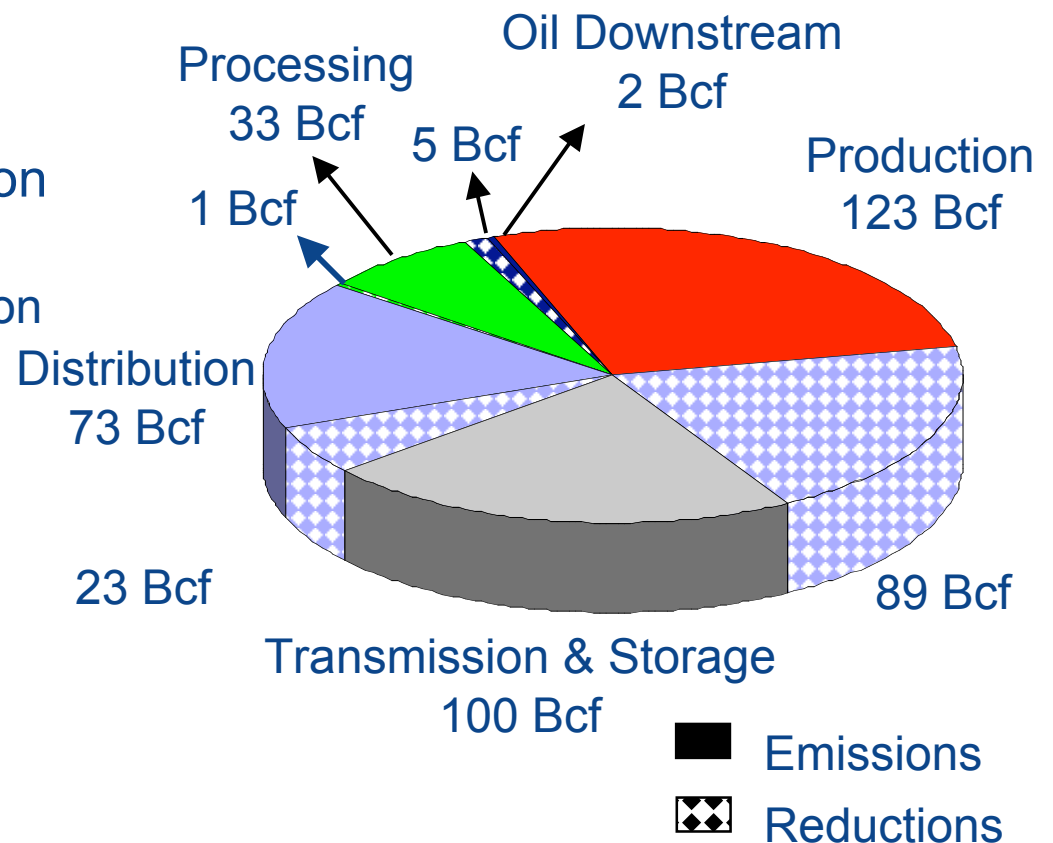


Source: ULC Robotics

# Limited Penetration of Methane Emissions Reductions in Transmission/Distribution

- 🔥 Technologies and practices to reduce methane emissions are mature
- 🔥 However, penetration of reduction options has been low
  - 💧 19% reduction from transmission
  - 💧 2% reduction from distribution
  - 💧 In comparison production has reported methane emissions reduction of 41%

🔥 **The issue seems to be more policy related than technology related**



EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2007*. April, 2009. Available on the web at: [epa.gov/climatechange/emissions/usinventoryreport.html](http://epa.gov/climatechange/emissions/usinventoryreport.html)

Note: Natural Gas STAR reductions from gathering and boosting operations are reflected in the production sector.

# Policy Barriers to Implementing Emissions Reduction Projects

- ⚡ EPA is working to understand what barriers exist such that it can effectively promote the implementation of the technologies and practices available to reduce methane emissions
  - ⚡ Feedback is welcome from industry, trade associations, key government agencies, and other stakeholders to further understand and address these barriers
  
- ⚡ EPA does not endorse a specific solution to remove barriers to implementing emissions reduction projects
  - ⚡ However, EPA wants to highlight the fact that without overcoming these policy barriers significant penetration of reduction options will be hindered

## Policy Barriers: Transmission Sector

- 🔥 Costs and risks associated with a rate case
  - 🔥 The cost of pipeline investments in emission reductions can only be recovered via a rate case
    - 🔥 Or from the creation of a “rate tracker,” which also requires a regulatory proceeding
  - 🔥 The pipeline’s achieved earnings can be reduced as a result of a rate case.
    - 🔥 This can occur if there has been an extended period of time since the last case resulting in accumulated depreciation of the pipeline rate base that would result in new rates that are lower than the existing rates.
    - 🔥 Rate case opens the door to other issues.

## Policy Barriers: Transmission Sector

- 🔥 No revenue from emissions reductions recovered by the pipeline
  - 🔥 Benefits from emissions reductions/gas savings are passed on to the shipper (pipeline customer)
- 🔥 A fully contracted pipeline realizes full revenue irrespective of loading of pipeline
  - 🔥 Transmission company gas transportation rates are based on capacity (reservation or demand charge) of pipelines rather than actual loads of gas moved (volumetric charge)
  - 🔥 Hence, there is little or no incentive invest capital to save off-peak leakage

## Policy Barriers: Distribution Sector

- 🔥 Customers must pay for reduction projects
  - 🔥 Costs/benefits from emissions reductions/gas savings are passed on to the consumer
  - 🔥 Consumers are short-sited: generally unwilling to accept higher rates for infrastructure improvements that lead to more efficient operation and lower rates in later years
- 🔥 Capital recovery through volumetric rates
  - 🔥 Recovery of capital investment is often linked to volumetric rates despite efforts to “decouple” rates that have been proposed in many states

# Policy Barriers: Distribution Sector

## 🔥 Financing projects

- 🔥 Capital investments for emission reduction projects are largely financed through borrowed money
- 🔥 Without clear cost recovery, this could result in downward evaluation of the company's credit rating, which in and of itself can increase the overall cost of capital

## 🔥 Investment priorities

- 🔥 Economic choice on investment in existing infrastructure improvement versus investment in expansion to new customers
- 🔥 Investing in improvement to existing infrastructure increases rates, economically deters consumption, potentially result in lost revenue
- 🔥 Investment in new customers moves more gas, lowers rates, and earns more revenue



# Conclusions

- 🔥 Methane emissions are the major source of GHG emissions in the natural gas and oil industries
  - 🔥 Emissions reduction efforts should focus on methane emissions as it will have the largest impact on overall emissions and is a valuable resource
- 🔥 Proven technologies and practices for identifying, measuring and reducing methane emissions are currently available for use in the transmission and distribution sectors
- 🔥 Policy barriers exist which inhibit the implementation of these technologies and practices
  - 🔥 Understanding of these barriers must be improved so that solutions may be developed