

Natural Gas STAR Program



Innovative Technologies for the Oil & Gas
Industry: Product Capture, Process
Optimization, and Pollution Prevention

Producers and Processors
Technology Transfer Workshop

New Mexico Oil and Gas Association and
EPA's Natural Gas STAR Program
Farmington, NM
February 21, 2006



1



Agenda

- 🔥 Background – U.S. Methane Emissions
- 🔥 Methane Emissions in the U.S. Oil and Gas Industry
- 🔥 Gas STAR Program Overview & Accomplishments
- 🔥 Opportunities for Maximizing Efficiency and Profits Through Methane Reduction Projects
- 🔥 Gas STAR Program Resources

2



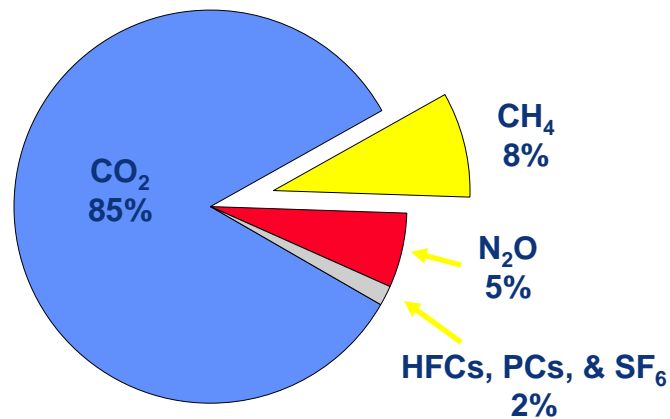
The “So What” – Why are we here?

- ♠ Reducing methane emissions from the U.S. oil and gas industry has cross-cutting impacts
 - ♠ Addressing environmental and global warming concerns
 - ♠ Potential for increased profits and operational efficiency in the oil & gas sector
 - ♠ Increasing domestic natural gas supply

3



U.S. Greenhouse Gas Emissions – All Sources

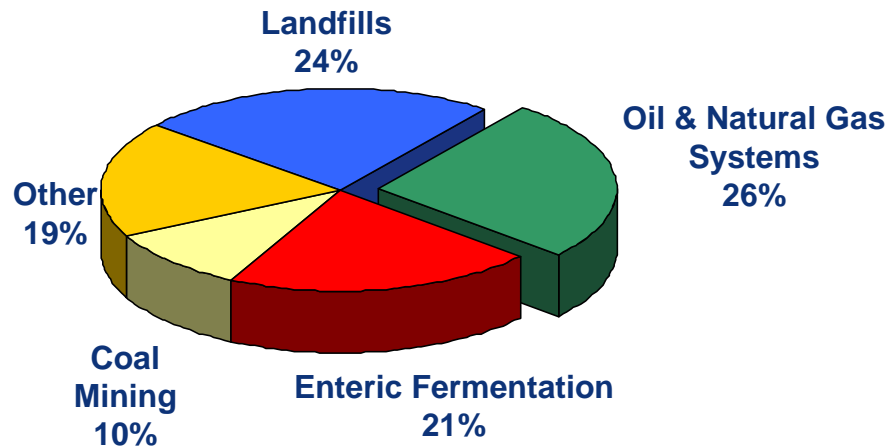


Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2003, USEPA, April, 2005

4



U.S. Methane Emissions



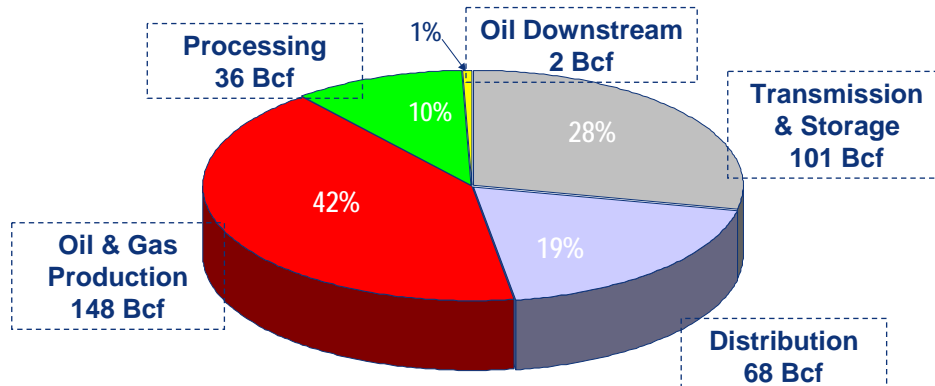
Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2003, USEPA, April, 2005

5



U.S. Oil & Natural Gas Industry

- ♦ Methane losses from the U.S. oil & natural gas industry total 355 Bcf
- ♦ Accounts for 2% of total U.S. greenhouse gas emissions



Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 - 2003

6



U.S. Oil & Natural Gas Opportunities

- ⦿ 355 Bcf of methane emissions per year amounts to
 - ⦿ \$3.55B in lost revenue at \$10/Mcf natural gas
 - ⦿ Global warming equivalent of putting over 31 million additional cars on the road in the U.S.
 - ⦿ Gas supply capable of heating over 5 million U.S. households for a year
- ⦿ U.S. oil and gas industry has an opportunity to cost effectively reduce these impacts

7



Natural Gas STAR Program

The Natural Gas STAR Program is a ***flexible, voluntary partnership*** between EPA and the oil and natural gas industry designed to ***cost-effectively*** reduce methane emissions from natural gas operations.

8



Gas STAR Partners & Endorsers

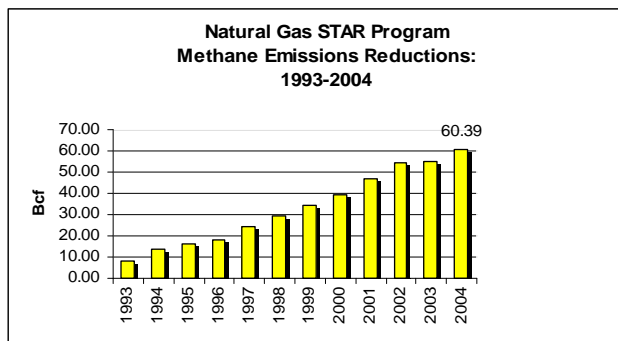
- 🔥 110 Program Partners across all four sectors
 - 💡 Recommended technologies and practices come directly from partner companies and industry experts
- 🔥 17 endorser associations, including
 - 💡 American Petroleum Institute (API)
 - 💡 Domestic Petroleum Council (DPC)
 - 💡 Gas Processors Association (GPA)
 - 💡 Independent Producers Association of Mountain States (IPAMS)
 - 💡 Interstate Oil & Gas Compact Commission (IOGCC)
 - 💡 Southern Gas Association
 - 💡 Colorado Oil & Gas Association (COGA)
 - 💡 Petroleum Association of Wyoming (PAW)
 - 💡 Petroleum Technology Transfer Council (PTTC)
 - 💡 Independent Producer's Association of America (IPAA)

9



Natural Gas STAR Partner Accomplishments

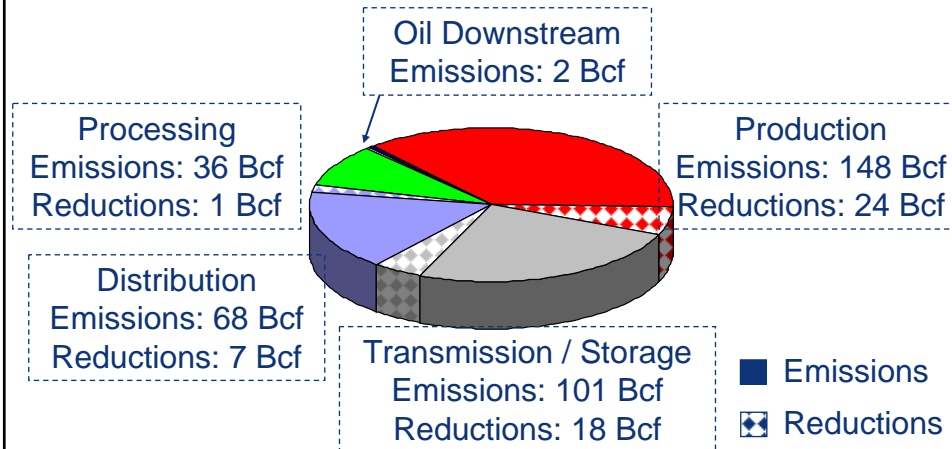
- 🔥 Natural Gas STAR Partners have reduced methane emissions by 403 Bcf
- 🔥 Methane emissions from U.S. oil and gas sector below 1990 levels



10



Oil & Gas Methane Emissions Without Gas STAR Program (2003)



11



Methane Emission Reduction Opportunities

- Partners have reported over 80 technologies and practices for achieving cost effective methane emission reductions

Best Practices - Production

- Perform reduced emission completions
- Install vapor recovery units
- Install plunger lifts
- Install instrument air systems
- Eliminate unnecessary equipment and/or systems
- Install electric compressors

Best Practices - Processing

- Conduct helicopter leak surveys
- Conduct infrared leak surveys
- Replace glycol dehydration units with methanol injection
- Install electric compressors
- Use hot taps for in-service pipeline connections

12

Maximizing Efficiency of Glycol Dehydrators

- ⚡ Triethylene Glycol is the common technology for removing moisture from produced natural gas
- ⚡ Glycol also absorbs methane, VOCs and HAPs
- ⚡ Glycol reboilers vent absorbed water, methane, VOCs, HAPs to the atmosphere
 - ⚡ Wastes gas, costs money, reduces air quality
- ⚡ Levels of glycol circulated are often 2-3 times higher than needed
 - ⚡ Results in higher methane emissions and fuel use
- ⚡ On average, 600 Mcf methane per glycol dehydrator is emitted each year

13

Emission Reduction Options

- ⚡ Install flash tank separator (FTS)
 - ⚡ Recovers all methane bypassed and most methane absorbed by glycol
- ⚡ Optimize glycol circulation rate
 - ⚡ Methane emissions are directly proportional to glycol circulation rate



14



Is Recovery Profitable?

Two Options for Minimizing Glycol Dehydrator Emissions

Option	Capital Costs	Annual O&M Costs	Emissions Savings	Payback Period
Optimize Circulation Rate	Negligible	Negligible	130 – 13,133 Mcf/year	Immediate
Install FTS	\$5,000 - \$10,000	Negligible	236 – 7,098 Mcf/year	1 month – 4 years

15



Partner Experience

- 💧 Texaco (now Chevron) has installed FTS on dehydrators in Southern Texas and Louisiana
 - 💧 Recovers 98% of methane from the glycol
 - 💧 Reduced emissions from 1,232 - 1,706 Mcf/year to <47 Mcf/year
- 💧 One partner routes glycol gas from FTS to fuel gas system, saving 24 Mcf/day (8,760 Mcf/year) at each dehydrator unit

More information available in the “Optimize Glycol Circulation and Install of Flash Tank Separators in Dehydrators” Lessons Learned document at www.epa.gov/gasstar/

16

Methane Losses from Storage Tank Venting

- ⚡ Flash losses occur when crude is transferred from a gas-oil separator at higher pressure to an atmospheric pressure storage tank
- ⚡ Working losses - occur when crude levels change and when crude in tank is agitated
- ⚡ Standing losses - occur with daily and seasonal temperature and pressure changes



17

Maximizing Efficiency Through Use of Vapor Recovery Units (VRU's)

- ⚡ Capture up to 95% of hydrocarbon vapors vented from tanks
- ⚡ Recovered vapors have higher Btu content than pipeline quality natural gas
- ⚡ Recovered vapors are more valuable than natural gas and have multiple uses
 - ⚡ Re-inject into sales pipeline
 - ⚡ Use as on-site fuel
 - ⚡ Send to processing plants for recovering NGLs

18



Types of Vapor Recovery Units

- ⦿ Conventional vapor recovery units (VRUs)
 - ⦿ Use rotary compressor to suck vapors out of atmospheric pressure storage tanks
 - ⦿ Require electrical power or engine
- ⦿ Venturi ejector vapor recovery units (EVRU™) or Vapor Jet
 - ⦿ Use Venturi jet ejectors in place of rotary compressors
 - ⦿ Do not contain any moving parts
 - ⦿ EVRU™ requires source of high pressure gas and intermediate pressure system
 - ⦿ Vapor Jet requires high pressure water motive

19



Industry Experience: Chevron

- ⦿ Chevron installed eight conventional VRUs at crude oil stock tanks in 1996
 - ⦿ At today's gas prices, economics are very attractive

Project Economics – Chevron				
Methane Loss Reduction (Mcf/unit/year)	Approximate Savings per Unit ¹	Total Savings	Total Capital and Installation Costs	Payback
21,900	\$219,000	\$1,752,000	\$240,000	<1 year

¹Assumes a \$10 per Mcf gas price; excludes value of recovered natural gas liquids. Refer to the Gas STAR *Lessons Learned* for more information.

20

Lessons Learned

- 💧 Vapor recovery can yield generous returns when there are market outlets for recovered gas
 - 💧 Recovered high heat content gas has extra value
 - 💧 VRU technology can be highly cost-effective in most general applications
 - 💧 Venturi jet models work well in certain niche applications, with reduced operating and maintenance costs
- 💧 Potential for reduced compliance costs can be considered when evaluating economics of VRU, EVRU™, or Vapor Jet

More information available in the “Installing Vapor Recovery Units on Crude Oil Storage Tanks” Lessons Learned document at www.epa.gov/gasstar/

Program Resources

- 💧 Guidance on recommended practices & technologies
 - 💧 Detailed implementation guides, including partner case studies
 - 💧 Economic analysis tools
 - 💧 Communication tools
- 💧 Available on www.epa.gov/gasstar
- 💧 Technology Transfer workshops
 - 💧 Free and open to the public
- 💧 Annual record of Partner methane savings
- 💧 One-on-one technical assistance





Workshops

- 🔥 Technology Transfer Workshops (5 to 6 per year)
 - 🔥 **Producers and Processors Technology Transfer Workshop**
February 21, 2006
Farmington, New Mexico, San Juan College
 - 🔥 **Producers and Processors Technology Transfer Workshop**
Sponsored by Western Gas Resources & Petroleum Association of WY
May 9, 2006,
Gillette, Wyoming
 - 🔥 **Producers and Processors Technology Transfer Workshop**
Sponsored by Western Gas Resources & Petroleum Association of WY
May 11, 2006
Rock Springs, Wyoming
 - 🔥 **Producers and Processors Technology Transfer Workshop**
Sponsored by ConocoPhillips
May 25, 2006
Alaska

23



White House “Methane to Markets” Initiative

- 🔥 Five year activity to develop verifiable methane emissions reduction projects at landfills, coal mines and natural gas systems.
- 🔥 Goal is to build long-term capacity within developing countries and economies in transition.
- 🔥 Countries include: Argentina, Australia, Brazil, China, Colombia, India, Italy, Japan, Mexico, Nigeria, Russia, Ukraine and UK.
- 🔥 Gas STAR will lead natural gas system-related activities, including upcoming launch of international program
- 🔥 www.methanetomarkets.org

24



Contact Information

Carey Bylin
202-343-9669
bylin.carey@epa.gov

epa.gov/gasstar