



Natural Gas STAR Program

Overview and Accomplishments

Producers and Processors Technology
Transfer Workshop
Midland, TX
July 23, 2008





Agenda

- 🔥 **Background**
- 🔥 **Natural Gas STAR Program Overview & Highlights**
- 🔥 **Program Resources and Tools**
- 🔥 **Greenhouse Gas Reporting Rulemaking**



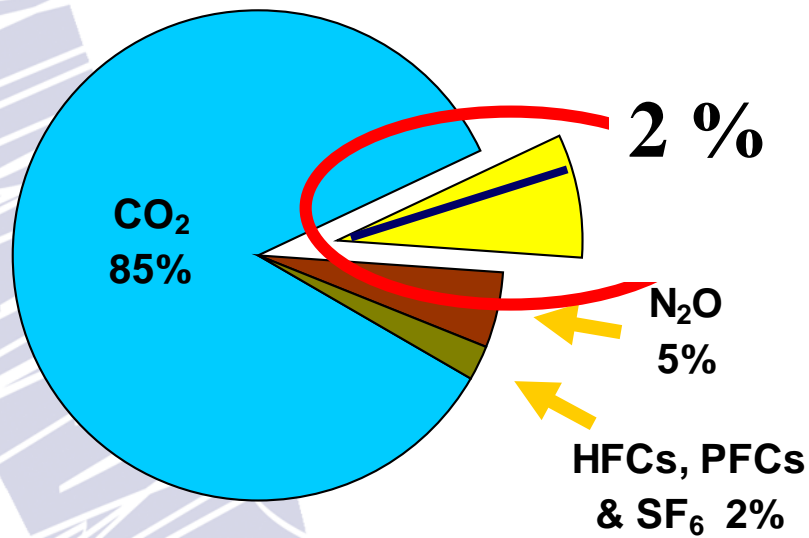
Background





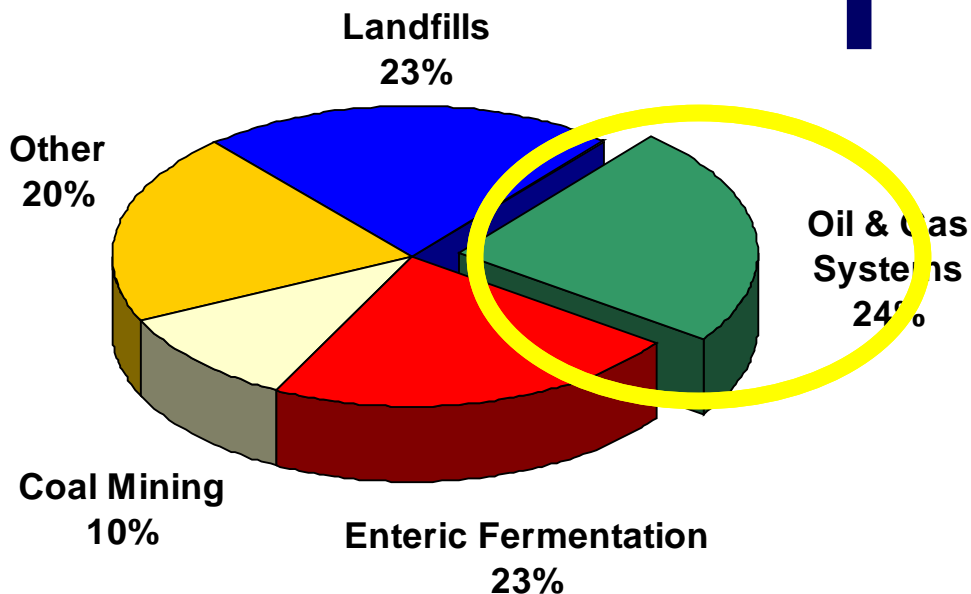
Current U.S. Greenhouse Gas Emissions Estimates

U.S. Greenhouse Gas Emissions All Sources



Methane emissions from Oil and gas systems make up 2% of total U.S. greenhouse gas emissions

U.S. Methane Emissions by Sector

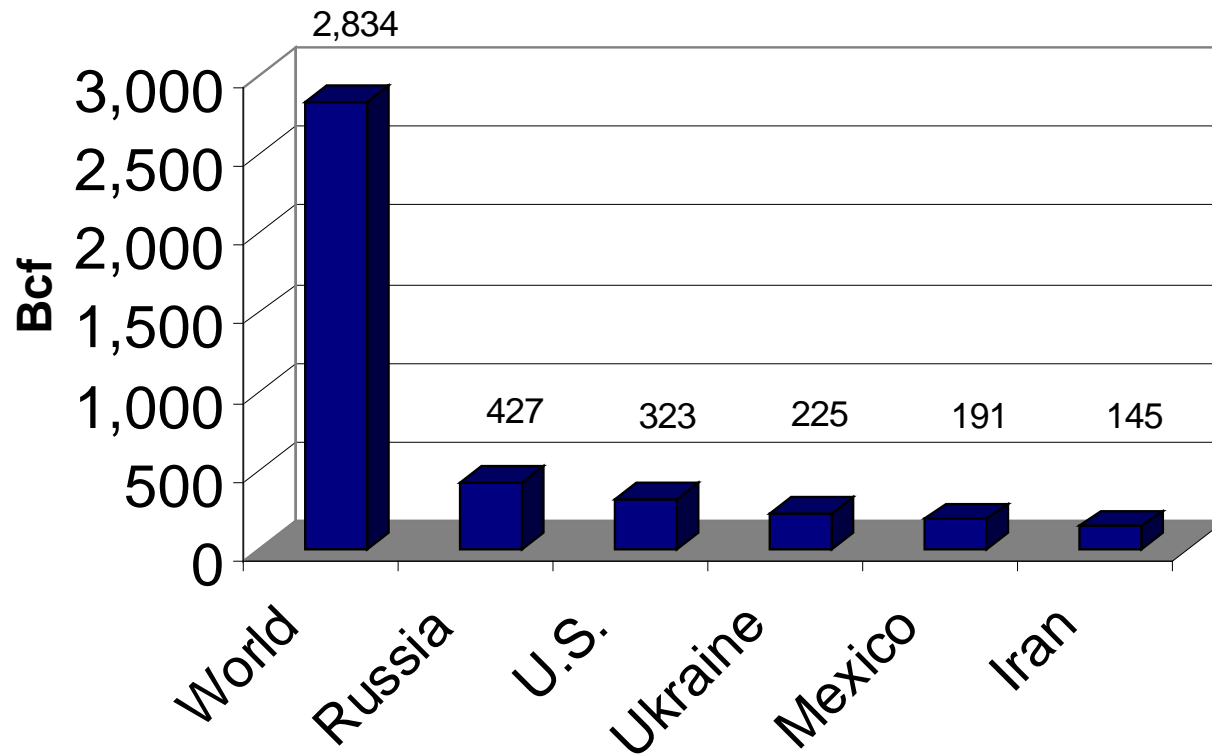


Oil and gas systems are the **largest** man-made source of methane emissions (24%)



Oil and Gas Industry Methane Emissions: U.S. & International

- U.S. contributes 11% of worldwide methane emissions from oil and gas systems



Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2006, USEPA, April, 2008
Global Anthropogenic Non-CO₂ Greenhouse Gas Emissions: 1990 – 2020, USEPA, June 2006



U.S. Oil & Natural Gas Opportunities: Why Gas STAR?

- 💧 323 Bcf of methane emissions per year amounts to:
 - 💧 \$2.26B worth of gas lost (at \$7/Mcf)
 - 💧 CO2 emissions from the electricity use of 17.3 million homes for one year
 - 💧 Annual greenhouse gas emissions from 23.9 million passenger vehicles

- 💧 U.S. oil and gas industry has an opportunity to cost-effectively reduce methane emissions resulting in:
 - 💧 Increased operational efficiency
 - 💧 Increased profits
 - 💧 Increased domestic gas supply
 - 💧 Improved safety
 - 💧 Improved environmental performance
 - 💧 Better public relations





Overview & Program Highlights





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.

- 🔥 Over 120 Program Partners across four sectors
 - 🔥 Nine International Partners
 - 🔥 19 Endorser Associations



Participation Matters

The Natural Gas STAR Program only works if our Partners participate. Participation means:

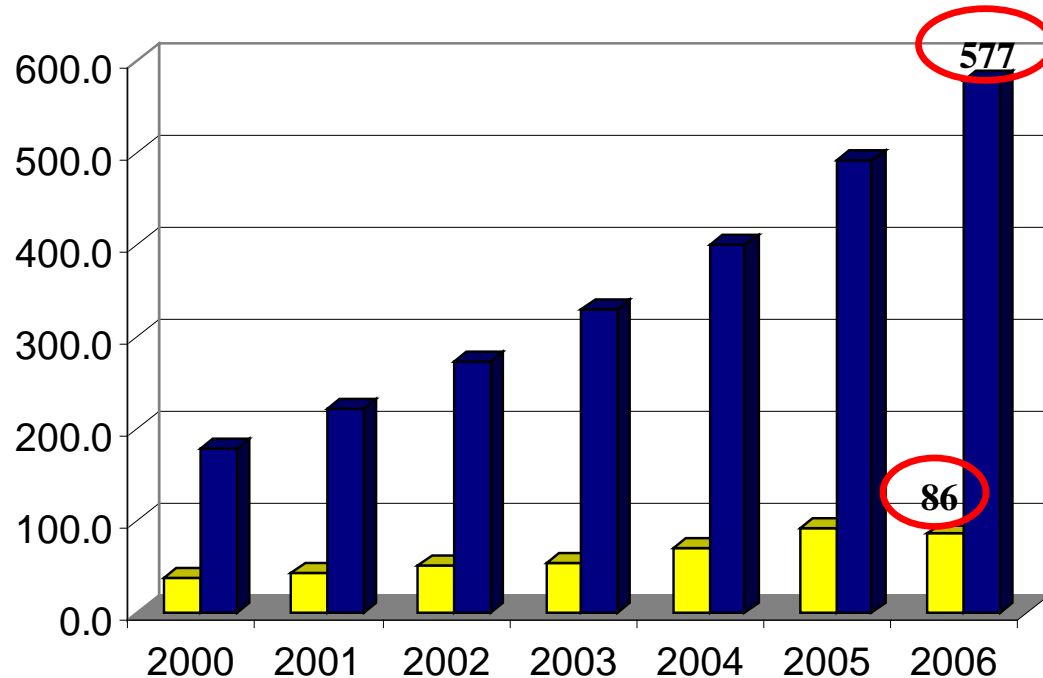
- 🔥 **Don't just check the box:** expand on your existing and future efforts to identify and implement new ways to reduce gas losses, save money, and make an impact on the environment
- 🔥 **Implement robust methods for quantifying leaks and vented emissions:** this will only increase in importance over time
- 🔥 **Report successes to Gas STAR:** which is currently the main knowledge base for the industry's efforts to reduce methane emissions



2006 Another Successful Year for Methane Emission Reductions

Gas STAR Partners reduced methane emissions by 86 Bcf in 2006

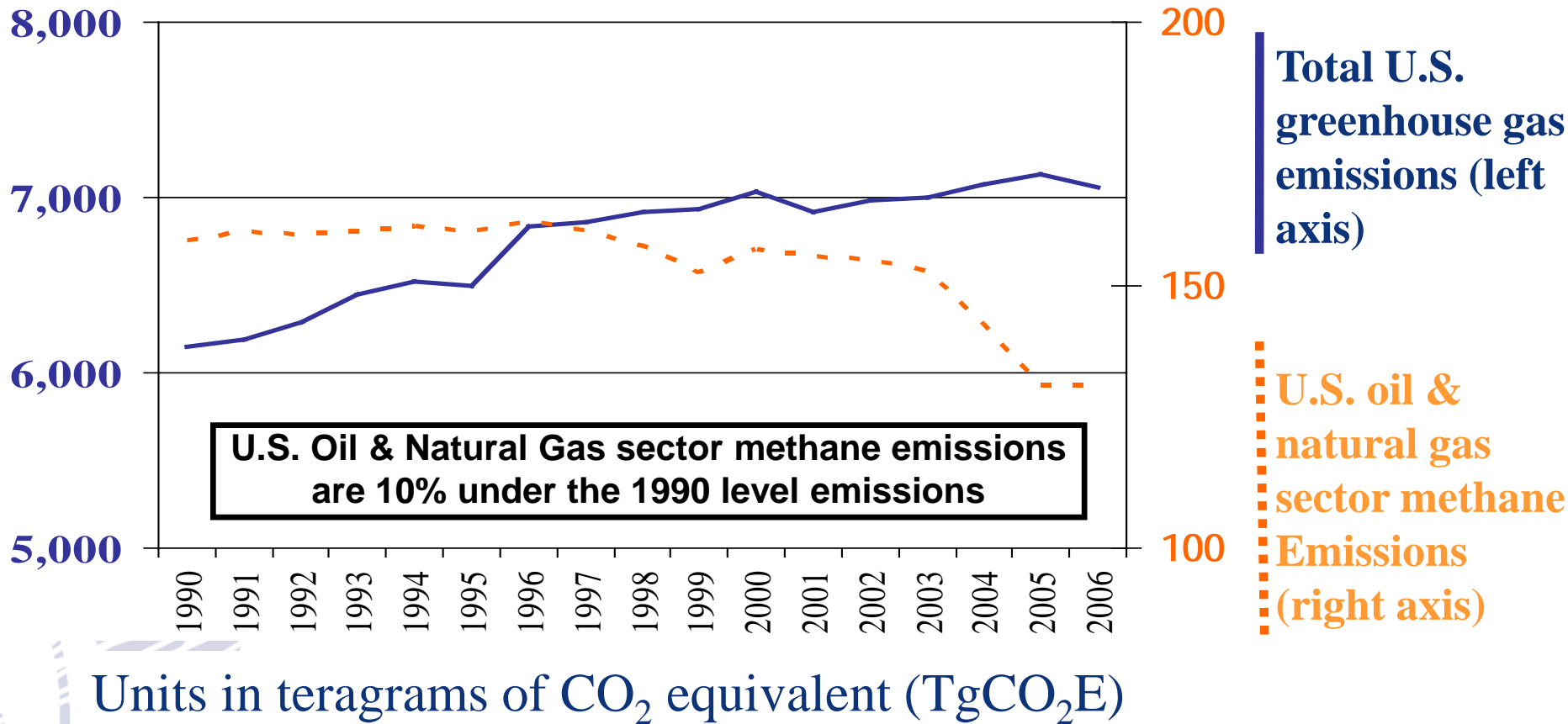
577 Bcf in cumulative reductions since 1990



Annual Reductions Cumulative Reductions Since 1990



Natural Gas STAR Partner Accomplishments (1990 – 2006)





Natural Gas STAR International

🔥 Natural Gas STAR International launched September 26, 2006 now has nine partners





Program Resources and Tools





Key Components

- ❖ **Guidance on new technologies & practices**
 - ❖ Technical documents on over 80 cost-effective technologies and practices
 - ❖ Free Technology Transfer workshops
 - ❖ One-on-one technical assistance to identify and prioritize cost-effective methane emission reduction opportunities
- ❖ **Annual record of Partner voluntary actions and methane savings**

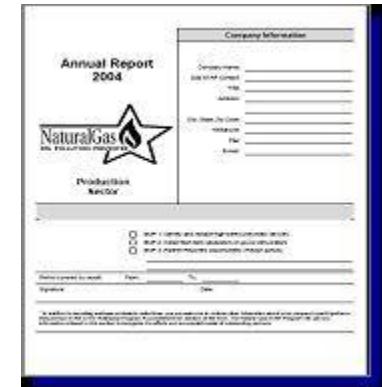


Technical Information



Project Demonstrations

Workshops



Annual Reports



What is Cost Effective?

The simple payback is the number of years it takes to pay back the capital cost of a project (based on \$3/Mcf)

🔥 Payback within 10 years	87%
🔥 Payback within 3 years	77%
🔥 Payback within 12 months	47%
🔥 Immediate payback	1%



Percentage of over 80 Gas STAR Recommended Technologies and practices at each payback level

Answer: Depends on company specific circumstances.



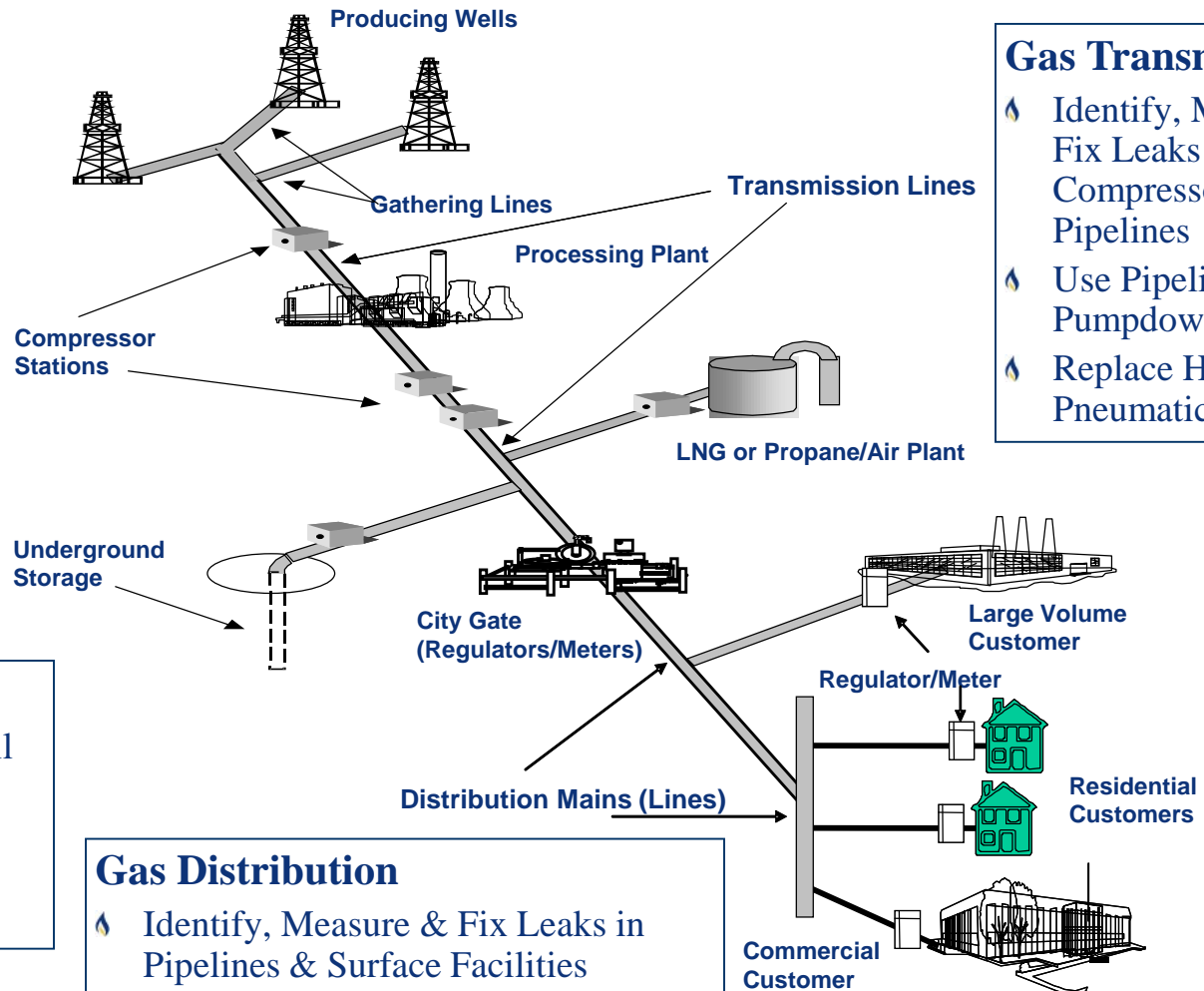
Methane Emission Reduction Technologies & Practices

Gas Production & Processing

- Reduced Emission Well Completions
- Install Plunger Lifts on Gas Wells
- Identify, Measure & Fix Leaks in Processing Plants
- Install Flash Tank Separators on Dehydrators

Oil Production

- Install VRUs on Crude Oil Storage Tanks
- Route Casinghead Gas to VRU or Compressor for Recovery & Use or Sale



Gas Transmission

- Identify, Measure & Fix Leaks in Compressor Stations, Pipelines
- Use Pipeline Pumpdown
- Replace High-Bleed Pneumatics

Gas Distribution

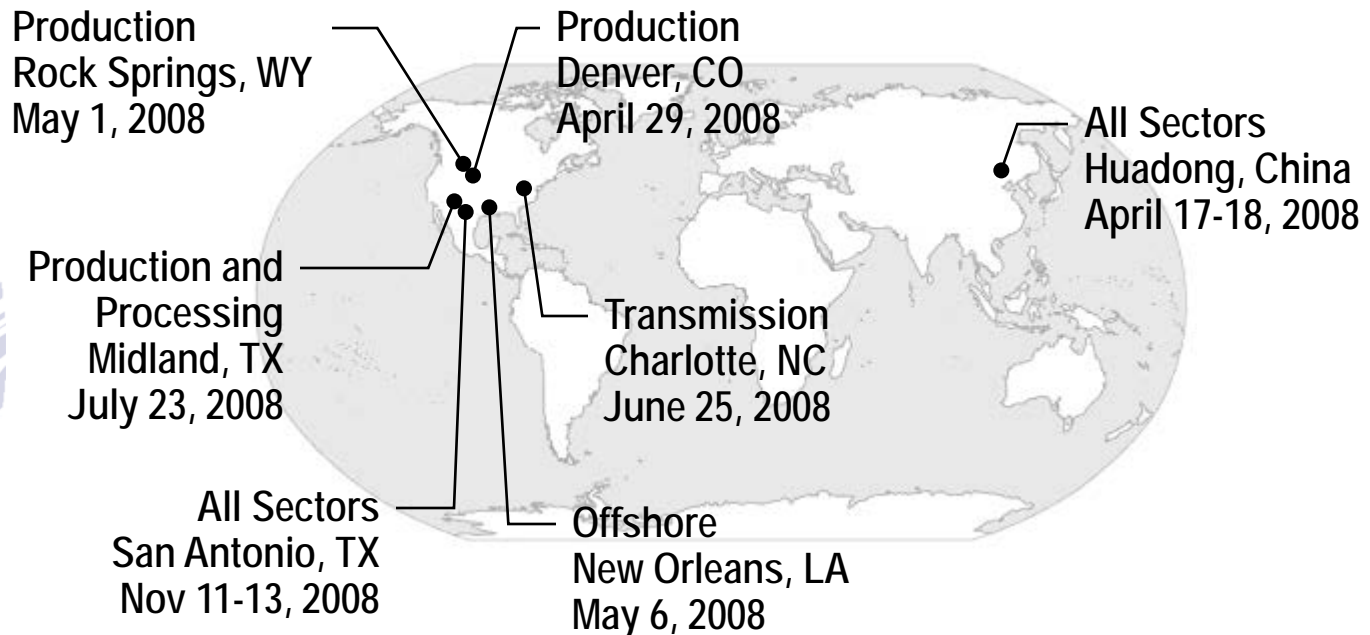
- Identify, Measure & Fix Leaks in Pipelines & Surface Facilities
- Inject Blowdown Gas into Low Pressure Mains

Picture courtesy of American Gas Association



2008 Technology Transfer Workshops

🔥 Natural Gas STAR will host, with partner organizations, the following Technology Transfer workshops in 2008



For more information, visit <http://www.epa.gov/gasstar/workshops.htm>



New Tool: Emission Reduction Calculation Guidance

🔥 Guidance for quantifying methane emission reductions from recommended technologies and practices

http://www.epa.gov/gasstar/docs/quantifying_ngs_methane_reductions.xls - Microsoft Internet Explorer

Edit View Insert Format Tools Data Go To Favorites Help

http://www.epa.gov/gasstar/docs/quantifying_ngs_methane_reductions.xls

A2

Natural Gas STAR Recommended Technologies and Practices - Quantification Methods Pipelines		
Technology/Practice Sector(s)	Quantification Method 1	Quantification Method 2
Composite wrap for non-leaking pipeline defects Processing Transmission Distribution	<p><u>Engineering Calculation</u></p> <p>Installing composite wrap opposed to replacing pipelines with defects saves the methane that would otherwise be vented to the atmosphere during replacement.</p> <p>Calculate emissions reductions by summing over all pipeline diameters and pressures: $ER = \sum (D^2 \cdot P \cdot [L/1,000] \cdot 0.372) / 1,000 \cdot XCH4$</p> <p>Where, ER = Emissions Reductions (Mcf/year) D = Inside diameter of pipeline (inches) L = Length of pipeline between shutoff valves (feet) P = Pipeline pressure (psia for less than 50psi, psig for more than 50psi) XCH4 = Mole fraction of methane in the gas (decimal) - default is 0.87 (Processing), 0.934 (Transmission/Distribution)</p> <p><u>References:</u> Composite Wrap for Non-Leaking Pipeline Defects Lessons Learned http://www.epa.gov/gasstar/pdf/lessons/ll_compwrap.pdf</p>	<p><u>Emissions Factor</u></p> <p>The volume of methane emissions saved by composite wrap is very sensitive of the operation - pipeline length, pipeline diameter, and system pressure. I know it is suggested to use the engineering calculation for better accuracy report composite wrap can save 3,960 Mcf/installment.</p> <p>Calculate emissions reductions using the following equation: $ER = AF \cdot 3,960 \text{ Mcf/installment}$</p> <p>Where, ER = Emissions Reductions (Mcf/year) AF = Activity Factor (number of installments/year) (EF assumed repair of a 6" defect on a 24" diameter pipeline at 350psig with shutoff valves.)</p> <p><u>References:</u> Composite Wrap for Non-Leaking Pipeline Defects Lessons Learned http://www.epa.gov/gasstar/pdf/lessons/ll_compwrap.pdf</p>
Identify and	<u>Engineering Calculation</u>	<u>Emissions Factor</u>

Introduction / Compressors / Dehydrators / Other / **Pipelines** / Pneumatics-Controls / Tanks / Valves / We



Communications Tools/Materials

- 🔥 Effort underway to revise and update Gas STAR communications materials and Gas STAR website
 - 🔥 PowerPoint presentations
 - 🔥 Program Implementation Guidance
- 🔥 Goal: Make the tools and resources more useful and accessible
- 🔥 Your feedback is important!

The screenshot shows the EPA Gas STAR website in a Windows Internet Explorer browser window. The address bar shows the URL <http://www.epa.gov/gasstar/>. The page title is "Natural Gas STAR Program". The main content area includes a description of the program and a list of links for more information. The right sidebar features a video player titled "Natural Gas STAR Releases Video Highlighting Remote Sensing Leak Detection Technologies" and links to download the video and a PDF version.

U.S. Environmental Protection Agency

Natural Gas STAR Program

[Contact Us](#) | [Print Version](#) Search:

[EPA Home](#) > [Climate Change](#) > [Methane](#) > [Voluntary Program](#) > Gas STAR

The Natural Gas STAR Program is a flexible, voluntary partnership between EPA and the oil and natural gas industry. Through the Program, EPA works with companies that produce, process, and transmit and distribute natural gas to identify and promote the implementation of cost-effective technologies and practices to reduce emissions of methane, a potent greenhouse gas.

The following links provide more information on Natural Gas STAR:

- [Basic Information](#) – Learn more about methane emissions from oil and gas systems and how Natural Gas STAR is working collaboratively with the industry to reduce emissions.
- [Accomplishments](#) – Learn more about the Natural Gas STAR Program's successes in reducing methane emissions and bringing more natural gas to markets.
- [Partners](#) – Find the companies that are voluntarily working with EPA to reduce emissions from their operations.
- [Join the Program](#) – Learn how your company can join Natural Gas STAR and begin to enjoy the benefits of this important partnership.
- [Documents Tools, and Resources](#) – Find technical publications that provide information on reducing methane emissions from oil and natural gas systems, and online tools that will assist your company in reducing gas losses. Program forms and other Natural Gas STAR related information is also available.
- [Newsroom](#) – Find current news items, journal articles, and press releases about the Natural Gas STAR Program, our partners, and related information. Past issues of the Gas STAR Partner Update, the Program's quarterly newsletter, are also available.
- [Workshops/Conferences](#) – Learn more about upcoming events and activities including the annual workshop and technology transfer workshops.
- [International Activities](#) – Find information on international efforts to reduce methane emissions.
- [Frequent Questions](#)

Natural Gas STAR Releases Video Highlighting Remote Sensing Leak Detection Technologies

In an effort to promote new technologies for remote sensing leak detection, EPA's Natural Gas STAR Program has released a new video that highlights various leak detection technologies. These technologies detect methane leaks that are invisible to the human eye and are powerful tools in identifying and reducing methane emissions. Technologies highlighted in the video include: hand-held passive infrared cameras; infrared laser detectors; and aerial sensing - leak mapping systems*.

[View this video now](#) (WMV, 21.5 MB)
[Download PDF version](#) (PDF, 2 pp., 14 KB)

To view this video, you will need the Windows Media Player, available as a [free download](#).

*NOTICE: EPA makes no expressed or implied warranties as to the performance of any technology and does not certify that a technology will always operate as advertised. The end user is solely



Feedback to Partners: Post-Reporting Benchmarking

2005 Reporting Summary & Benchmarking Report

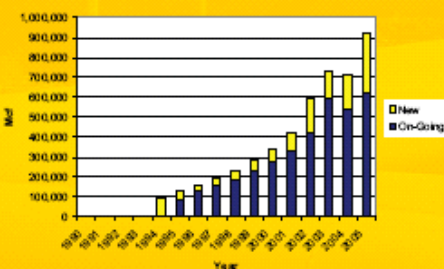
Report Summary

Joined Natural Gas STAR

Annual

2005 Annual methane emissions reductions

Since joining the Natural Gas STAR Program in 2001, this partner has achieved cumulative emission reductions



To achieve these reductions, this partner employed the following Natural Gas STAR methane emission reduction technologies and practices*

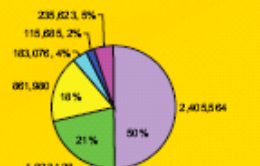
2005 Reductions:



- Eliminate unnecessary equipment or systems
- Reduce blowdown systems and alter ESD practices
- Replace glycol dehydration units with methanol injection
- Use IR camera/optical imaging for leak detection
- Use IR camera/optical imaging for pipeline connections
- Other*

*Other includes: Use IR camera/optical imaging for leak detection; Replace gas-assisted glycol pumps with electric pumps; Replace Glycol Separator Gas; Hydraulic valves; Use inert gases and pigs to perform pipeline purges.

Cumulative Reductions:



- Eliminate unnecessary equipment or systems
- Reduce blowdown systems and alter ESD practices
- Replace glycol dehydration units with methanol injection
- Use IR camera/optical imaging for leak detection
- Use IR camera/optical imaging for pipeline connections
- Other*

*Other includes: Use IR camera/optical imaging for leak detection; Replace gas-assisted glycol pumps with electric pumps; Replace Glycol Separator Gas; Hydraulic valves; Use inert gases and pigs to perform pipeline purges.

*Annual emissions reductions include new reductions plus ongoing reductions.

EMISSIONS REDUCTIONS ARE APPROXIMATELY EQUIVALENT TO:



The carbon offset equivalent of planting this many acres of trees:

585,000 (cumulative)
112,430 (annual)



Enough natural gas to heat this many homes for one year:

70,000 (cumulative)
13,425 (annual)



Removing this many cars from the road for one year:

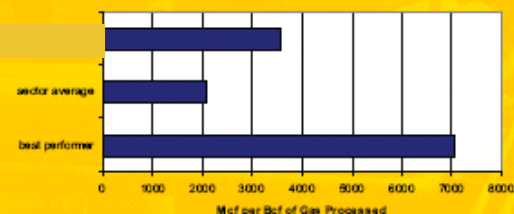
430,000 (cumulative)
82,450 (annual)

Benchmarking

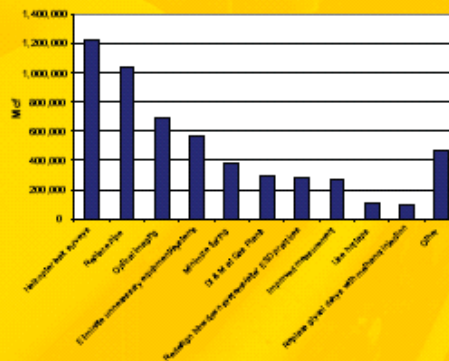
The Natural Gas STAR Program endeavors to assist partners in achieving full benefit of participation by raising awareness about activities that other partners have undertaken to achieve cost-effective emission reductions.

The following show this partner's methane emissions reductions versus the Sector Average and Best Performer in the Processing Sector. Emission reductions were normalized based on each partner's annual gas processing capacity.

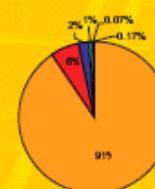
2005 Methane Emissions Reductions



Top 10 technologies and practices employed in the Processing Sector in 2005. Sector reductions totaled 5,424,568 in 2005.



The Best Performer for the Processing Sector achieved emission reductions through the following activities in 2005.



- Helicopter Leak Surveys
- Use IR camera/optical imaging for pipeline connections
- Replace gas processing unit with electric pumps
- Replace glycol separator gas with methanol injection
- Eliminate unnecessary equipment or systems
- Other*

*Other includes: Replace gas processing unit with electric pumps.

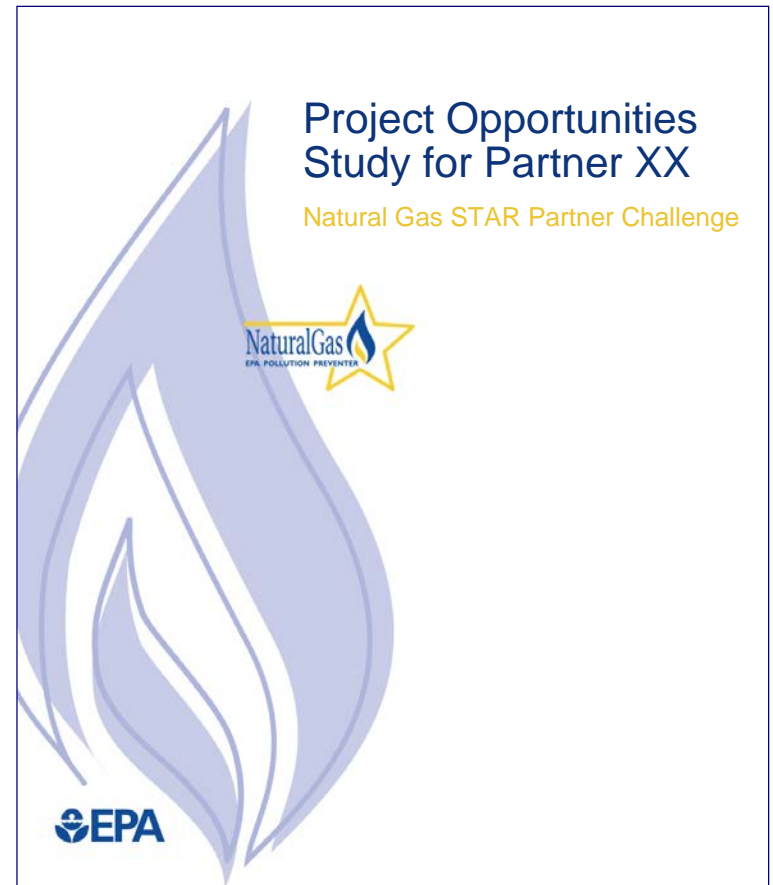
Based on top technologies and practices employed in the Processing Sector, other activities this partner might want to consider include:

- Helicopter leak surveys
- Replace pipe
- Optical imaging
- Minimize flaring
- DMM at gas processing stations



Natural Gas STAR “Partner Challenge”

- ❖ EPA offers assistance quantifying partners’ methane emissions and corresponding emission reduction opportunities
 - ❖ Uses customized data
 - ❖ Quantifies emission reductions and environmental benefits
 - ❖ Details economic and operational benefits of reduction technologies & practices





Overview: Greenhouse Gas Reporting Rulemaking





GHG Reporting Rulemaking

What is the 2008 Omnibus Appropriations Bill (HR 2764)?

The 2008 Omnibus Appropriations Bill (HR 2764) was signed into law in December 2007. The legislation signed by President Bush authorizes EPA to develop and publish a draft rule to **require mandatory reporting of greenhouse gas emissions above appropriate thresholds in all sectors of the economy**



Appropriations Language and Legal Authority

FY2008 Consolidated Appropriations Amendment:

- 🔥 “... not less than \$3,500,000 shall be provided for activities to develop and publish a draft rule not later than 9 months after the date of enactment of this Act, and a final rule not later than 18 months after the date of enactment of this Act, to require mandatory reporting of greenhouse gas emissions above appropriate thresholds in all sectors of the economy...”

Legal Authority:

- 🔥 Sections 114 and 208 of the CAA allow for data collection and measurement and recordkeeping from stationary or mobile related sources
- 🔥 Appropriations language provides EPA with \$3.5 million in FY 2008 to develop proposed & final rules



Purpose and Scope

🔥 **Objective(s) of the Program – to provide data that will inform and support development of national climate policy**

🔥 **Scope of Coverage**

- 🔥 Define gases- “...to require mandatory reporting of greenhouse gas emissions”
 - 🔥 CO₂, CH₄, N₂O, HFC, PFC, SF₆
- 🔥 Both upstream and downstream sources- “The Agency is further directed to include in its rule reporting of emissions resulting from upstream production and downstream sources...”
 - 🔥 Upstream: Fuel and Chemical producers/importers (e.g., oil refineries, natural gas processors, HFC producers)
 - 🔥 Downstream: GHG emitters (e.g., power plants, iron and steel plants, cement manufacturers)



Purpose and Scope cont.

🔥 Areas of flexibility:

- 🔥 Emissions threshold: “The Administrator shall determine appropriate thresholds of emissions above which reporting is required...”
- 🔥 Frequency of Reporting: “...and how frequently reports shall be submitted to EPA”

🔥 Methods:

- 🔥 “The Administrator shall have discretion to use existing reporting requirements....”
- 🔥 Build on methods from existing mandatory and voluntary reporting systems
 - 🔥 Federal reporting programs- e.g., Title IV, Climate Leaders, 1605(b)
 - 🔥 State Programs- e.g., California, The Climate Registry, RGGI, other state programs
 - 🔥 Corporate Programs- e.g., WRI/WBCSD
 - 🔥 Industry Protocols- e.g., API Compendium, CSI Protocol (cement), International Aluminum Institute



Timing and Process

- 🔥 Proposed rule by September 2008, final rule by June 2009
- 🔥 An ambitious timetable but we will work towards these deadlines
- 🔥 EPA welcomes stakeholder input and plans to reach out to stakeholders
- 🔥 EPA will involve agency and interagency expertise
 - 🔥 Have already worked extensively with interagency counterparts on measurement and reporting issues (e.g., US GHG inventory, IPCC guidelines)



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