



Natural Gas STAR Program

Overview and Accomplishments

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Agenda

🔥 Background

🔥 Natural Gas STAR Program Overview & Highlights

🔥 Program Resources and Tools

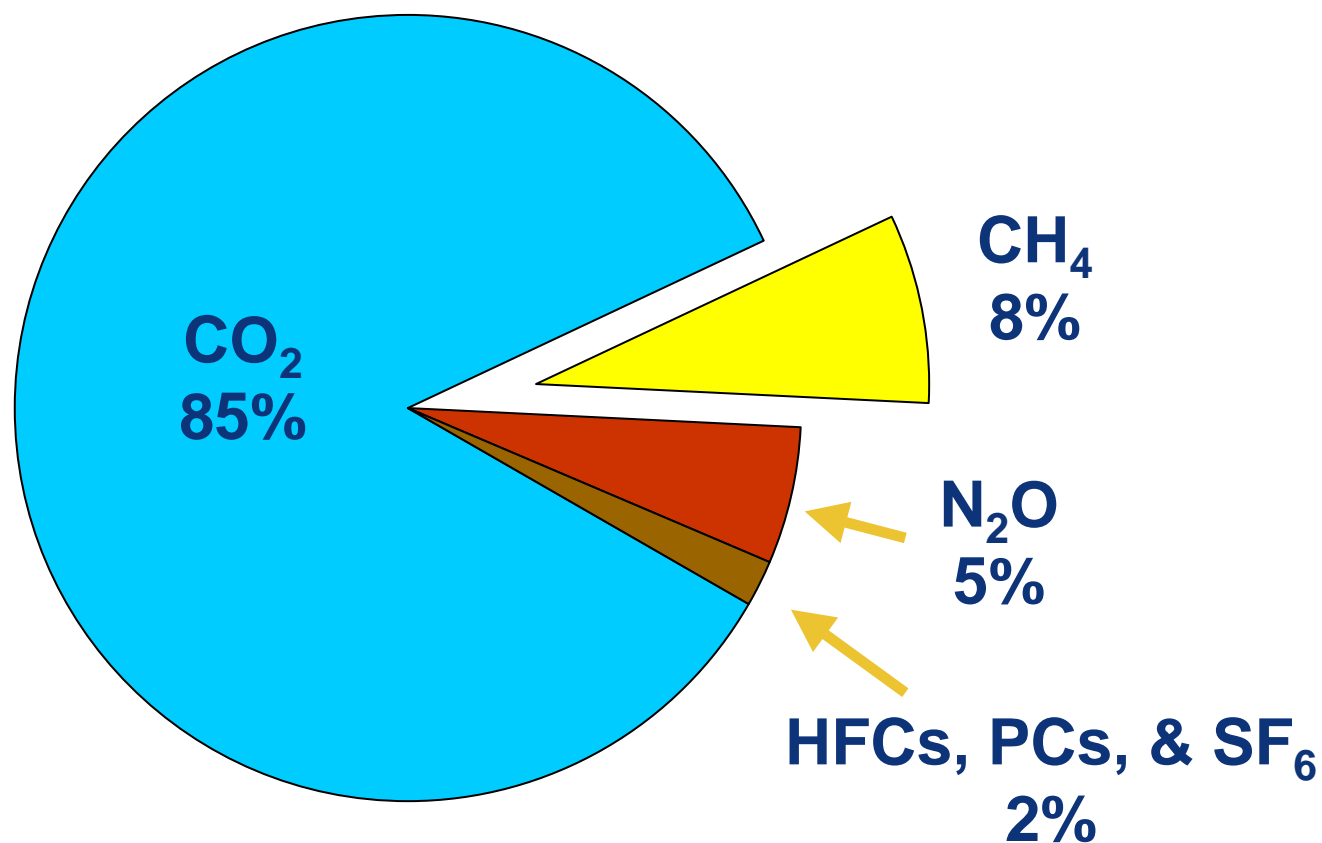


Background





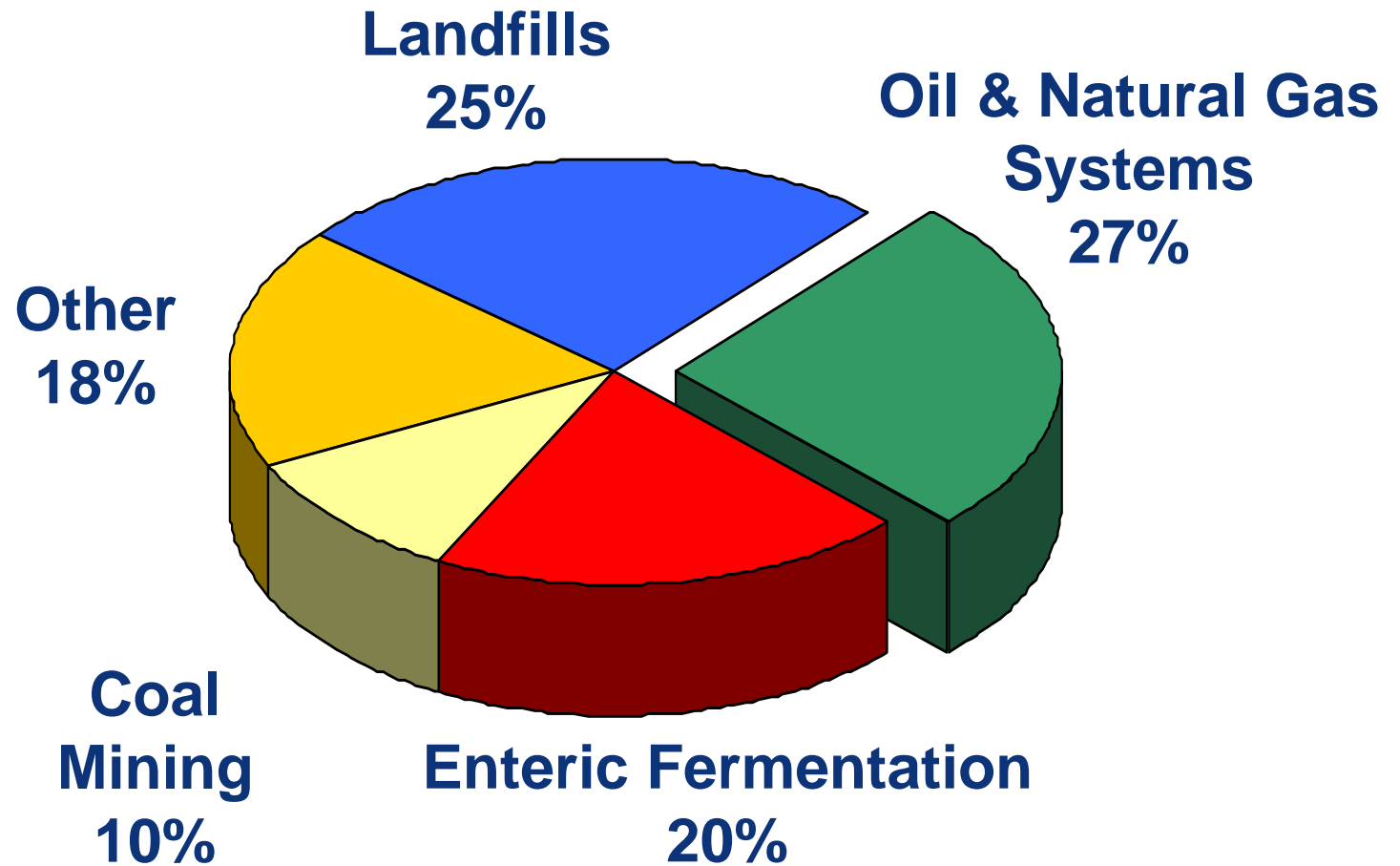
U.S. Greenhouse Gas Emissions All Sources



Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2004, USEPA, April, 2006



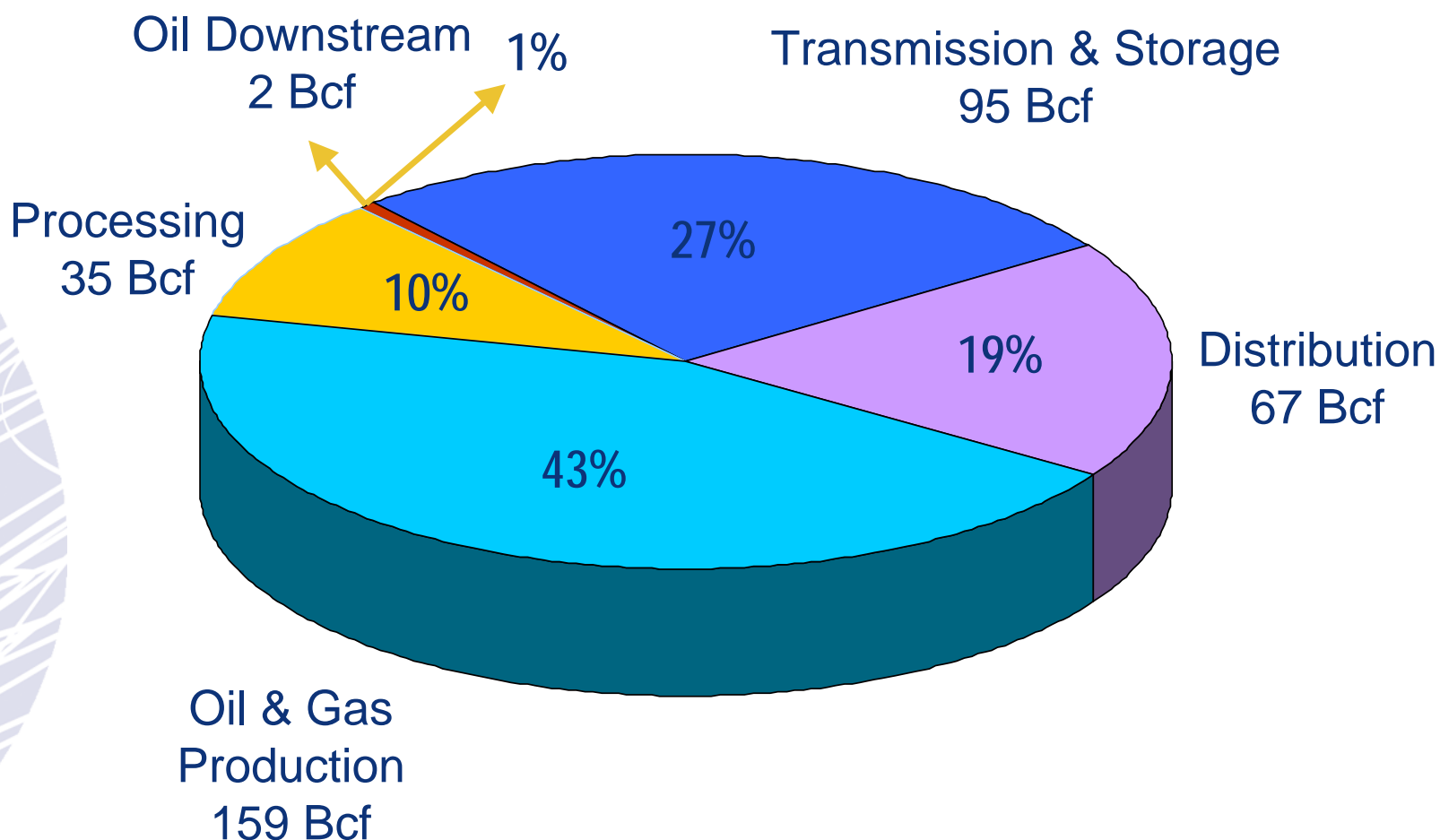
U.S. Methane Emissions



Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2004, USEPA, April, 2006



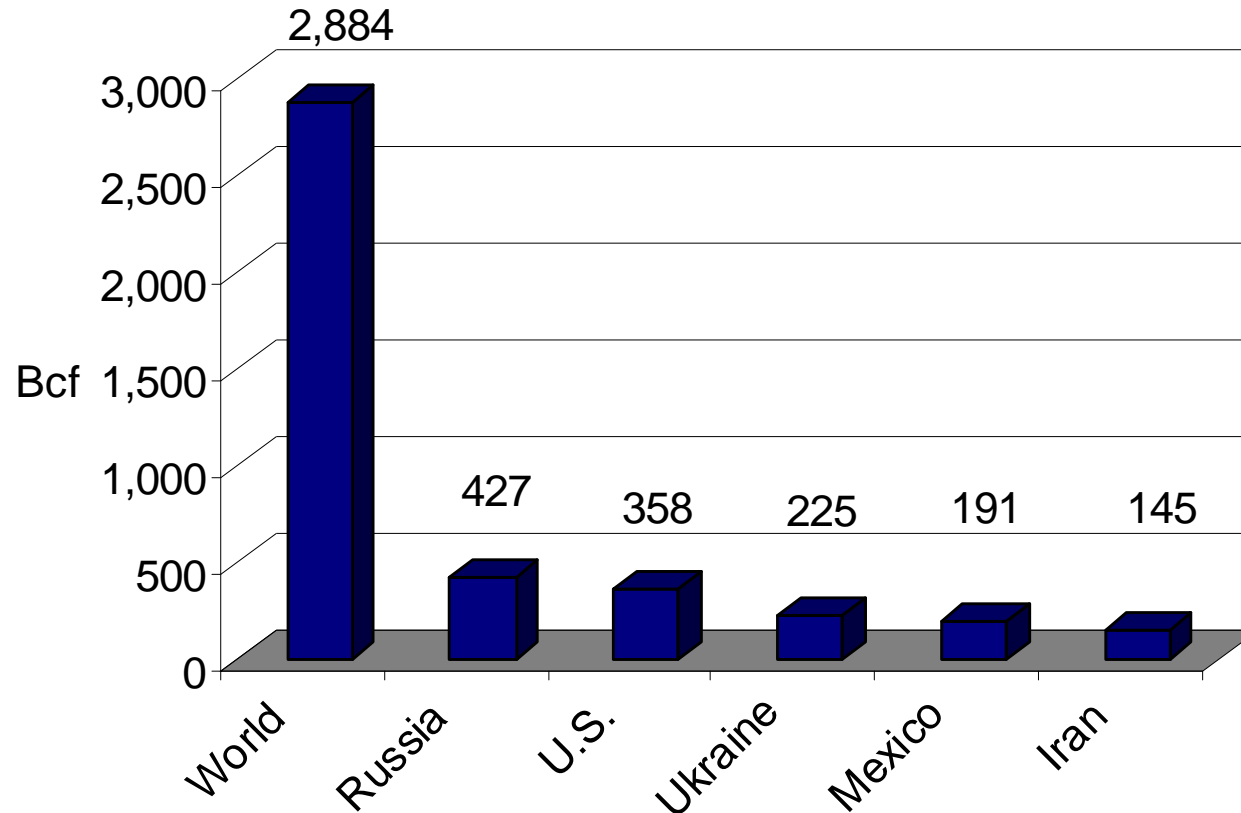
U.S. Oil and Gas Methane Emissions Breakdown by Sector





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

- 2005 U.S. methane emissions from oil and natural gas industry: 358 Bcf (2% of total U.S. greenhouse gas emissions)
- U.S. contributes 12% of worldwide methane emissions from oil and gas systems



Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2004, USEPA, April, 2006



U.S. Oil & Natural Gas Opportunities

- 💧 358 Bcf of methane emissions per year amounts to
 - 💧 \$2.51B in lost revenue at \$7/Mcf natural gas
 - 💧 Global warming equivalent of putting over 26 million additional cars on the road in the U.S.
 - 💧 Gas supply capable of heating almost 14 million U.S. households for a year
- 💧 U.S. oil and gas industry has an opportunity to *cost-effectively* reduce these impacts



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.

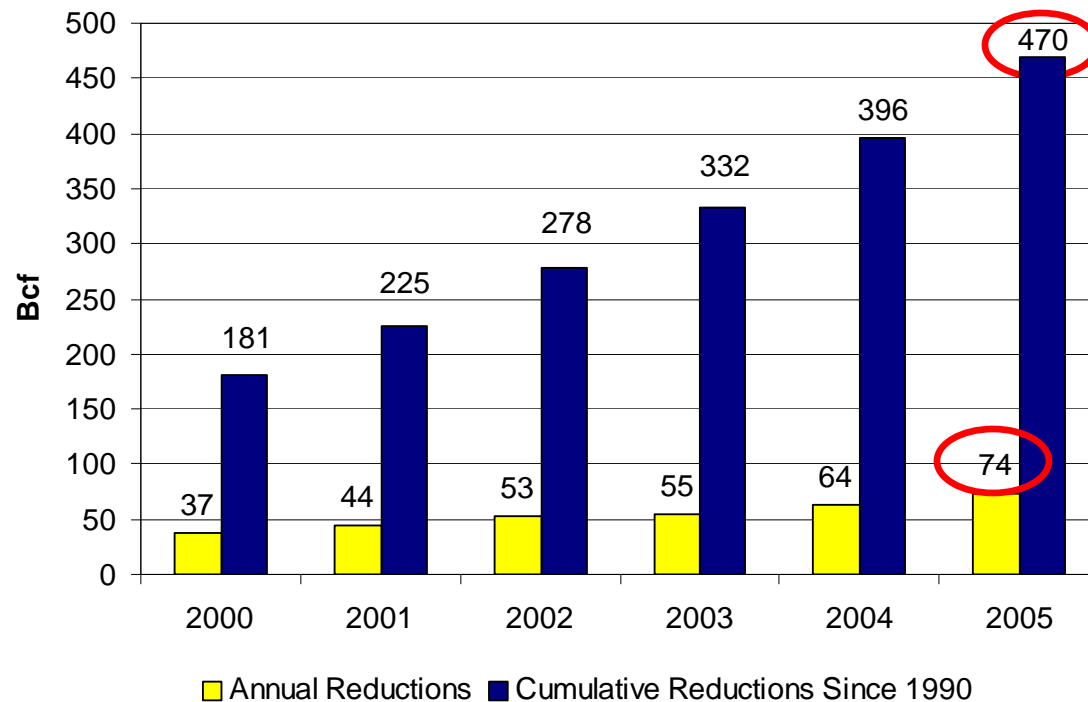
- 🔥 Over 110 Program Partners across four sectors
 - 🔥 Seven International Partners
 - 🔥 19 Endorser Associations



2005 Another Record Year for Natural Gas STAR Emission Reductions

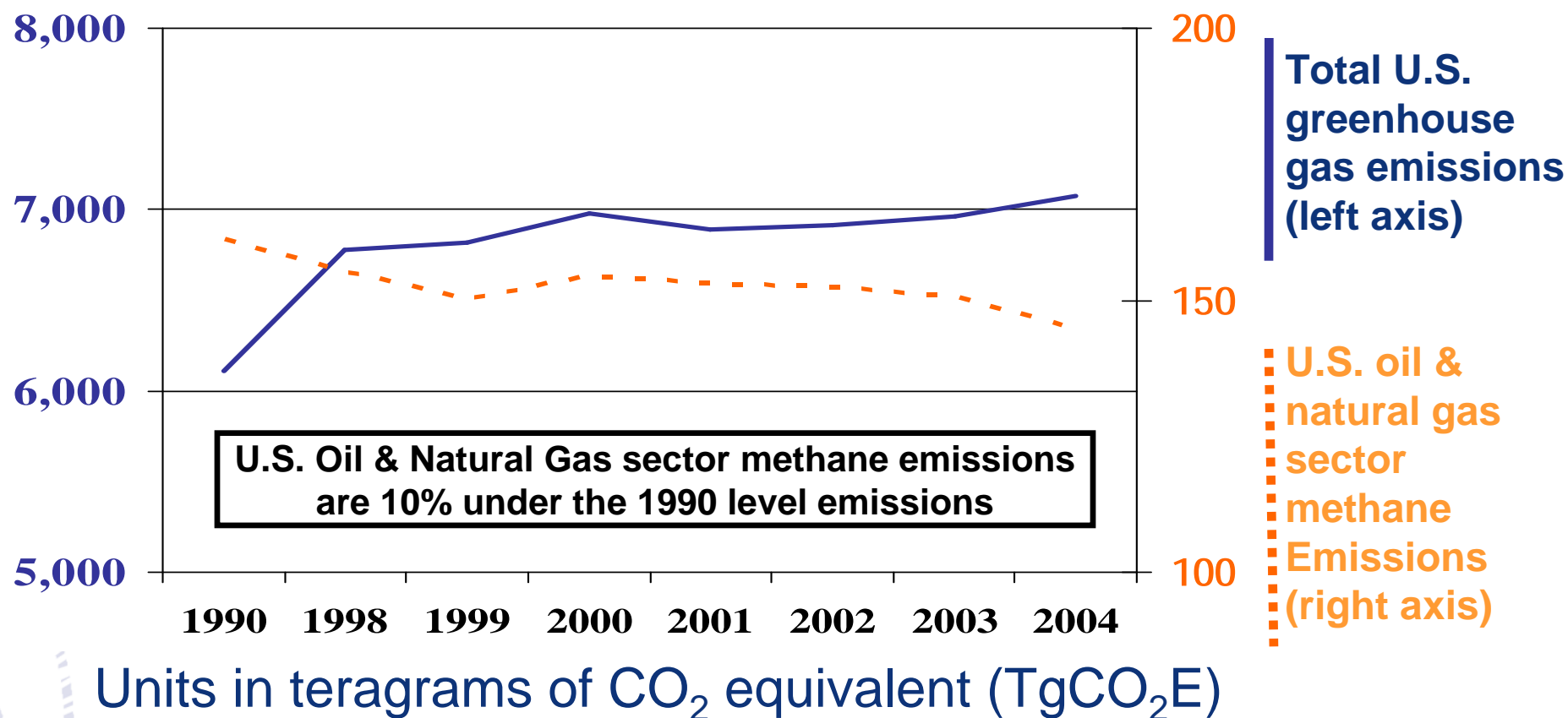
- Gas STAR Partners reduced methane emissions by 74 Bcf in 2005
- 470 Bcf in cumulative reductions since 1990

Natural Gas STAR Emissions Reductions





Natural Gas STAR Partner Accomplishments (1990 – 2004)



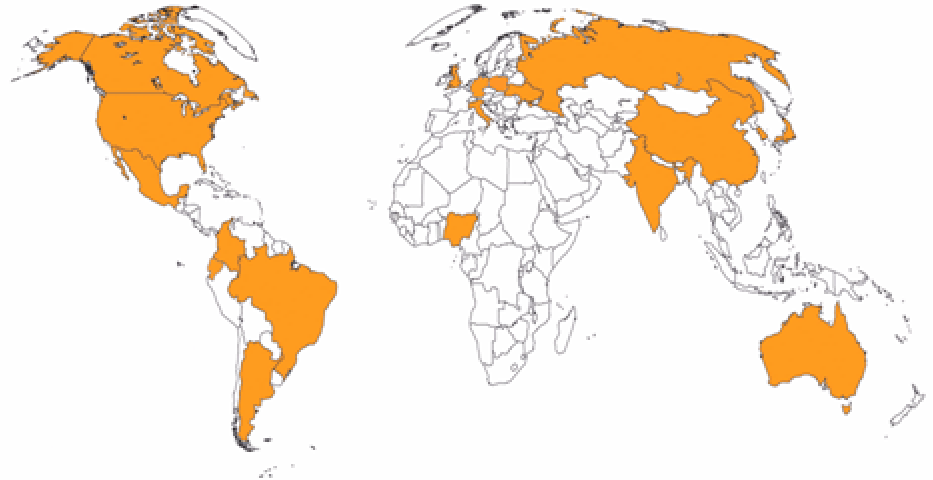


International Activities: White House “Methane to Markets” Initiative

- Initiative 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
- Natural Gas STAR will lead natural gas system-related activities, including launch of Natural Gas STAR International

20 partner countries

Argentina	Japan
Australia	Korea
Brazil	Mexico
Canada	Poland
Colombia	Nigeria
China	Russia
Ecuador	Ukraine
Germany	United K
India	United S
Italy	Vietnam





Natural Gas STAR International

- Under the Methane to Markets Partnership, U.S. EPA is expanding Natural Gas STAR internationally
- EPA is encouraging existing partners to engage their international operations to voluntarily reduce methane emissions
- Companies world-wide are welcome to join Gas STAR International



Methane to Markets

Oil and Gas Subcommittee





Natural Gas STAR International

🔥 Natural Gas STAR International launched September 26, 2006 with seven charter partners

 **ConocoPhillips**

devon

 **ENBRIDGE™**

ExxonMobil

 **Marathon
Oil Company**

 **OXY**

 **TransCanada**
In business to deliver



Program Resources and Tools





Natural Gas STAR Resources

- 💧 Guidance on new practices & technologies
 - 💧 Technical information and training
 - 💧 Assistance identifying cost-effective methane emission reduction opportunities
- 💧 Technology Transfer workshops
 - 💧 Free and open to the public
- 💧 Annual record of Partner voluntary actions and methane savings
- 💧 One-on-one technical assistance



Technical Information



Project Demonstrations

Workshops



Annual Reports



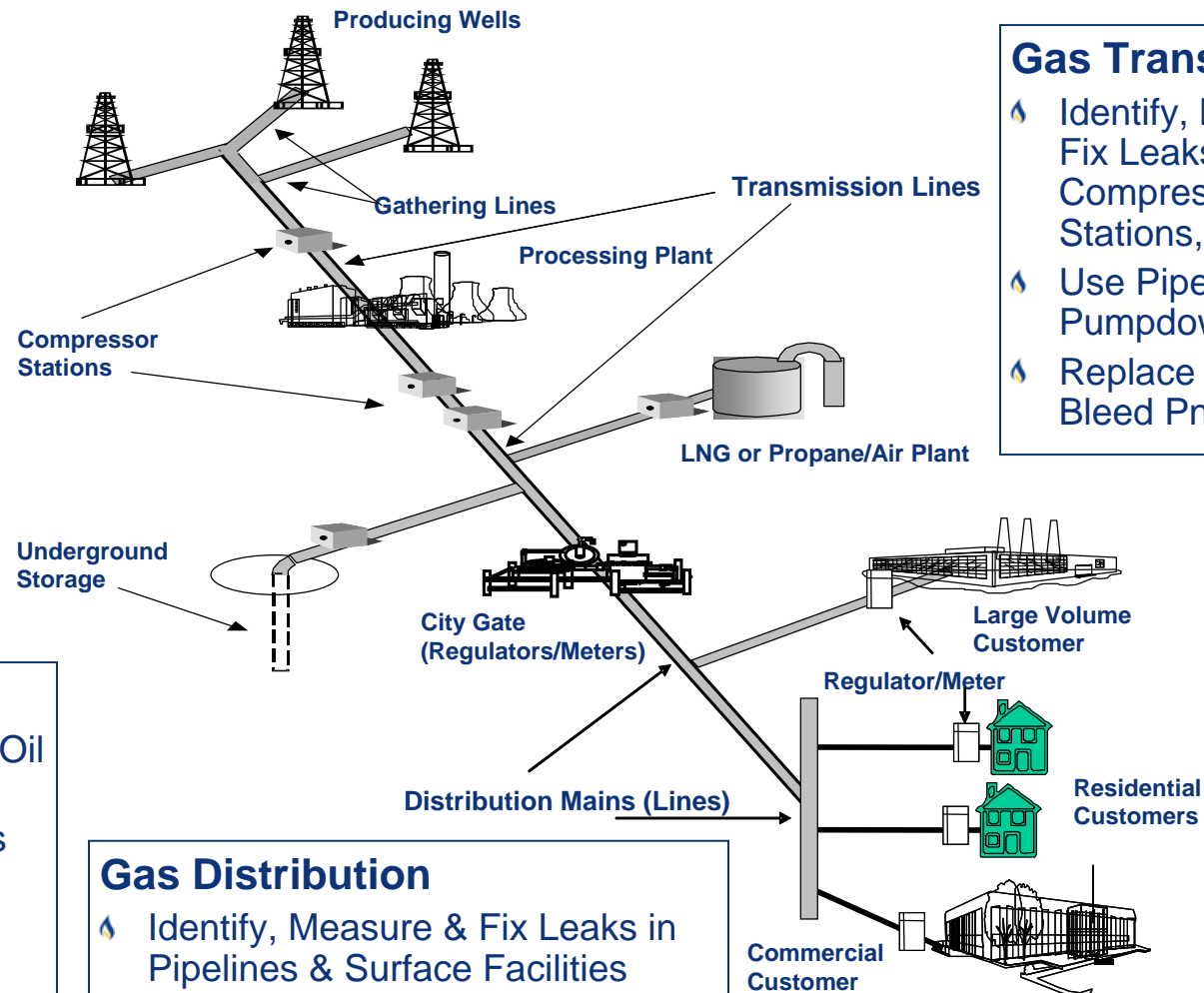
Methane Emission Reduction Technologies & Practices

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

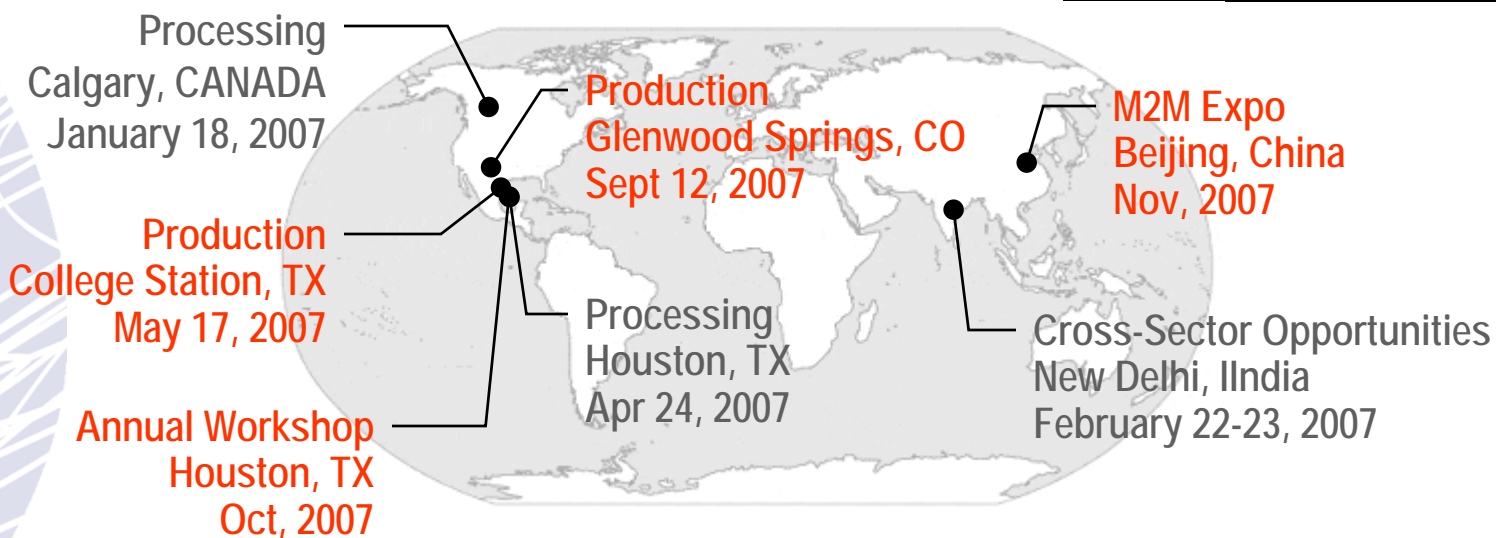
- Identify, Measure & Fix Leaks in Pipelines & Surface Facilities
- Use Pipeline Pumpdown Techniques to Minimize Venting

Picture courtesy of American Gas Association 18



2007 Technology Transfer Workshops

🔥 Natural Gas STAR will host, with partner organizations, the following Technology Transfer workshops in 2007



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_ngo_methane_reductions.xls - Microsoft Internet Explorer

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

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:</p> $ER = \sum \{ (D^2 \cdot P \cdot [L/1,000] \cdot 0.372) / 1,000 \} \cdot XCH_4$ <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. It is known 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

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



Communications Tools/Materials

- Effort underway to revise and update Gas STAR communications tools and materials
 - PowerPoint presentations
 - Program Implementation Guidance
 - Press releases
- Goal: to make the tools and resources more useful to Partners
- Your feedback is important!





Feedback to Partners: Post-Reporting Benchmarking

2005 Reporting Summary & Benchmarking Report

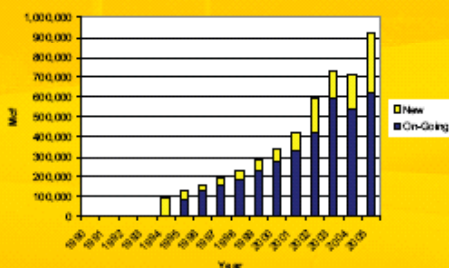
Report Summary

Joined Natural Gas STAR

Annual

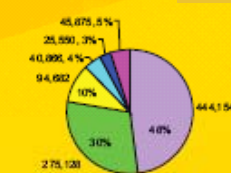
2005 Annual methane emissions reductions

Since joining the Natural Gas STAR Program in 2004, [redacted] has achieved cumulative emission reductions



To achieve these reductions, [redacted] employed the following Natural Gas STAR methane emission reduction technologies and practices.*

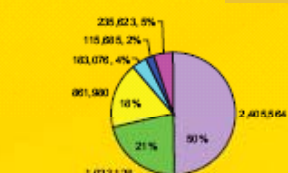
2005 Reductions:



- Eliminate unnecessary equipment or systems
- Replace old down systems and alter ESD practices
- Replace glycol dehydration units with molecular sieves
- Use IR camera/optical imaging for leak detection
- Use hot taps for in-service pipeline connections
- Other*

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

Cumulative Reductions:



- Eliminate unnecessary equipment or systems
- Replace old down systems and alter ESD practices
- Replace gas pneumatics with instrument air systems
- Replace glycol dehydration units with molecular sieves
- Install P-Flare to Eliminate Venting of Pipeline Maintenance Blow
- Other*

* Other includes: Use IR camera/optical imaging for leak detection, Replace gas-actuated glycol pumps with electric pumps, Replace Glycol Blower 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)



Enough natural gas to heat this many homes for one year:
70,000 (cumulative)
13,425 (annual)



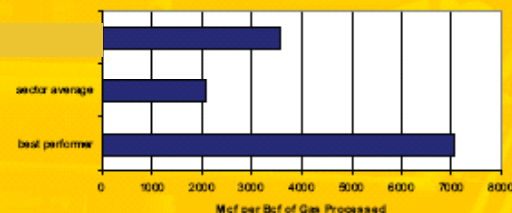
Removing this many cars from the road for one year:
430,000 (cumulative)
82,450 (annual)

Benchmarking

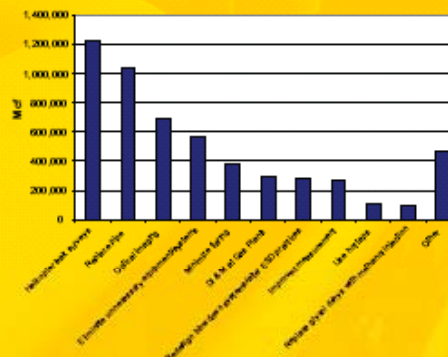
The Natural Gas STAR Program endeavors to assist partners in achieving full benefit of participation by raising awareness about activities that other partners have undertaken to achieve cost-effective emission reductions.

The following show [redacted] 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.

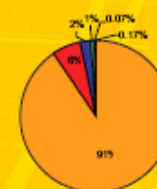
2005 Methane Emissions Reductions



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 hot taps for in-service pipeline connections
- Replace gas pneumatics with instrument air systems
- Install a dry powered chemical pump instead of gas-actuated pumps
- Eliminate unnecessary equipment or systems
- Other*

* Other includes: Replace gas-actuated glycol pumps with electric pumps

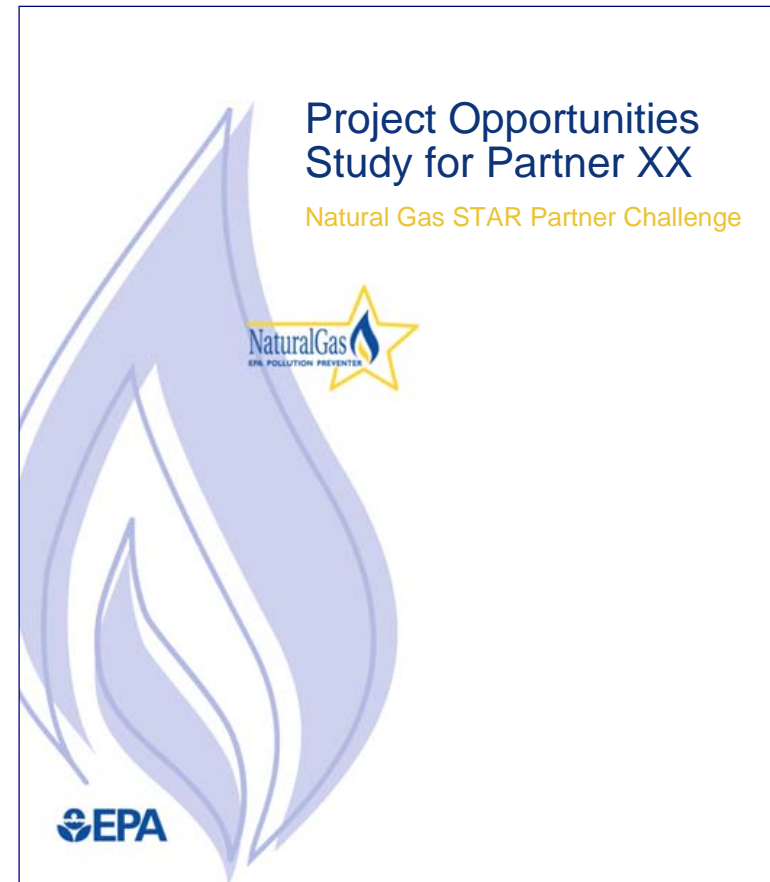
Based on top technologies and practices employed in the Processing Sector, other activities [redacted] might want to consider include:

- Helicopter leak surveys
- Replace pipe
- Optical imaging
- Minimize flaring
- DIAM 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





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