Natural Gas STAR Program

Natural Gas STAR 14th Annual Implementation Workshop

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October 23, 2007

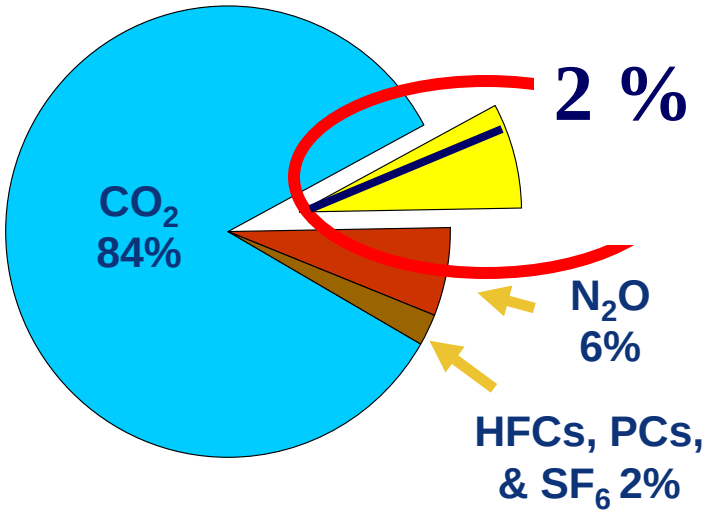
Agenda

- 2006/2007 Overview & Program Highlights
- New Program Resources and Services and Future Initiatives
- Introduction to 14th Annual Workshop

2006/2007 Overview & Program Highlights

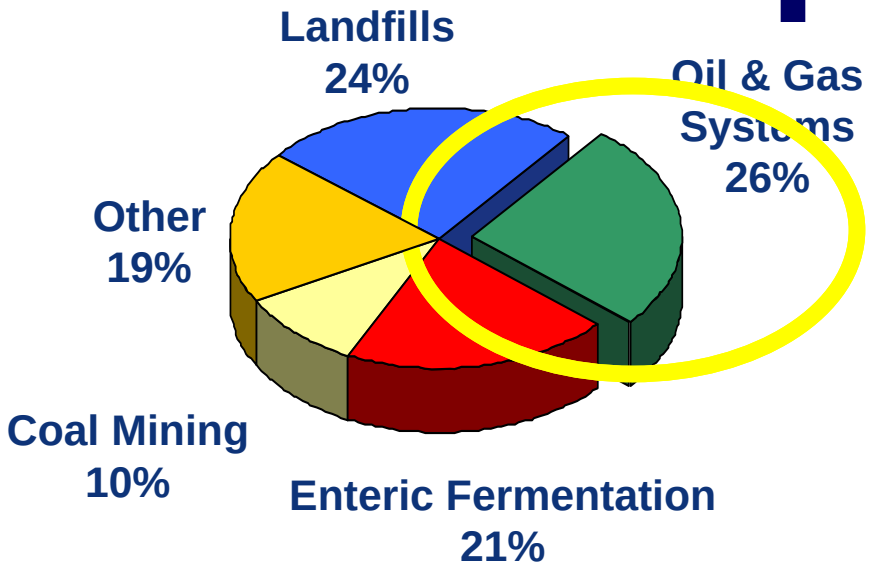
Current U.S. Greenhouse Gas Emissions Estimates

U.S. Greenhouse Gas Emissions All Sources



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

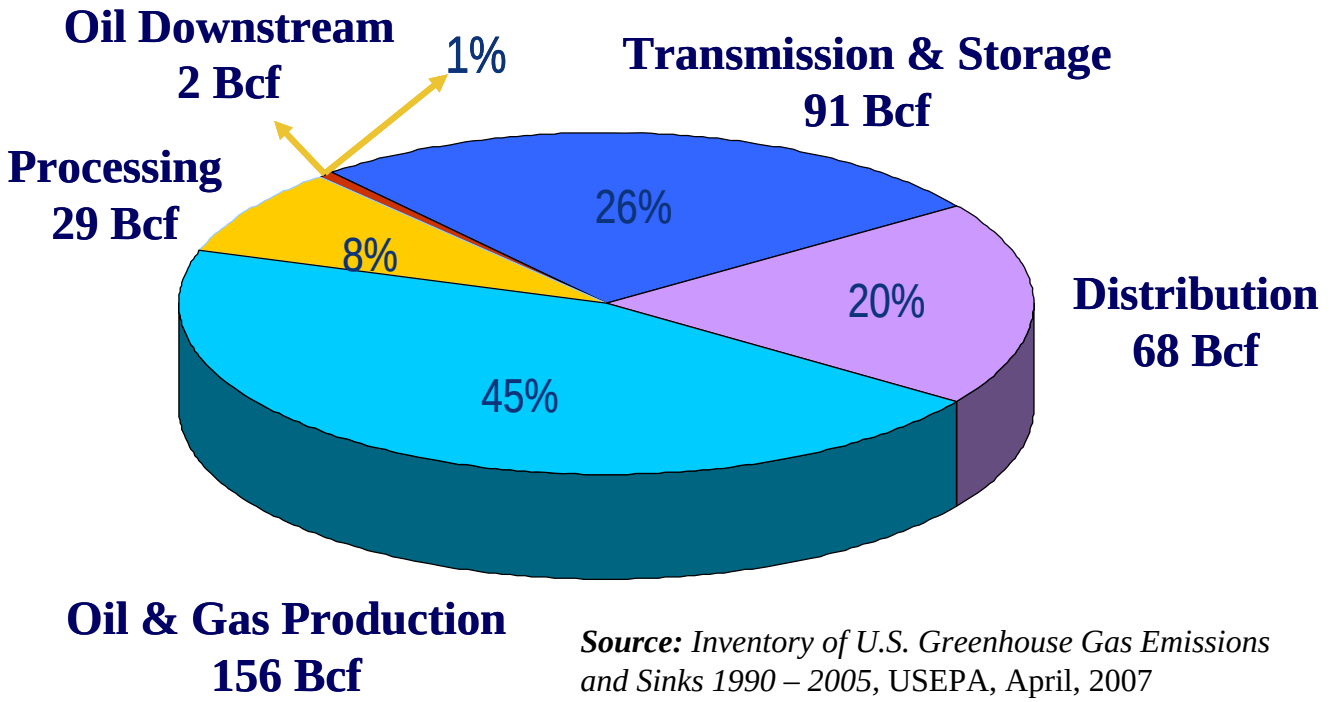
U.S. Methane Emissions by Sector



Oil and gas systems are the **largest** man-made source of methane emissions **(26%)** in US

Source: *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2005, USEPA, April, 2007*

U.S. Oil and Gas Methane Emissions



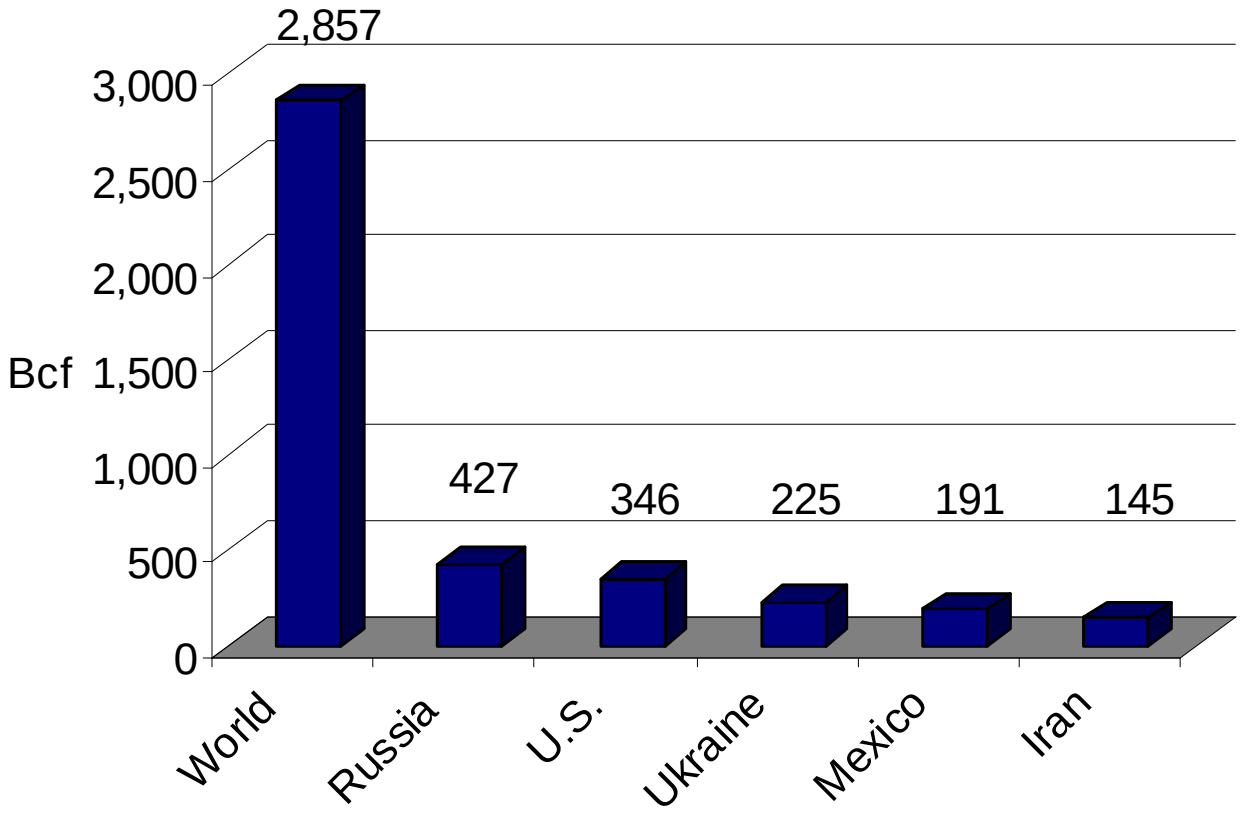
Source: *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2005*, USEPA, April, 2007

- Total **346 Bcf** equates to: $2.42B in lost revenue (at $7/Mcf);
- Gas supply capable of heating almost 5 million U.S. households/year;
- Global warming equivalent adding 30 million additional cars on road

Opportunity exists to *cost-effectively* reduce these impacts

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

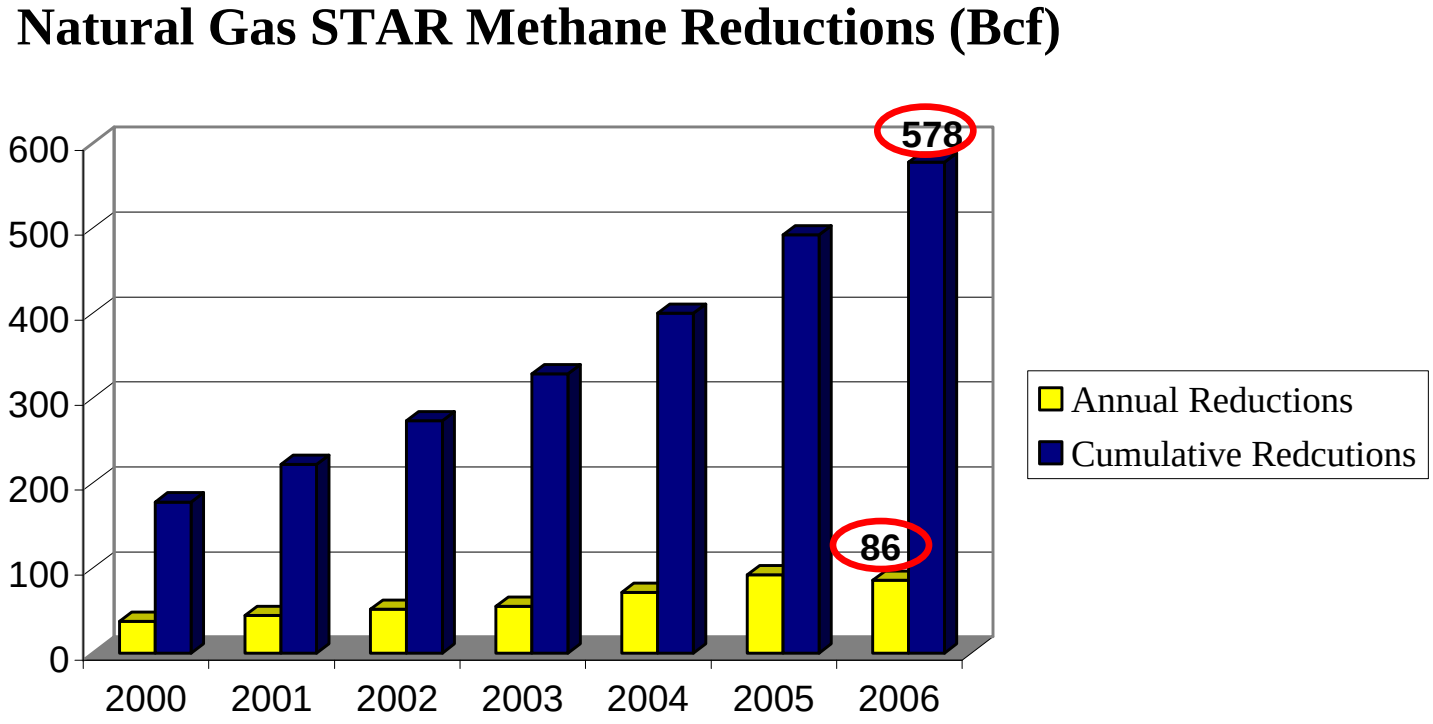
- U.S. contributes 12% of worldwide methane emissions from oil and gas systems



Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2005, USEPA, April, 2007
Global Anthropogenic Non-CO_2 Greenhouse Gas Emissions: 1990 – 2020, USEPA, June 2006

2006 Another Successful Year for Methane Emission Reductions

- Gas STAR Partners reduced methane emissions by 86 Bcf in 2006
  - 578 Bcf in cumulative reductions since 1990



Natural Gas STAR Program Continues to Grow

- **As of 2007, over 120 Partners**
- **New Partners**
  - Berkshire Gas
  - Chesapeake Energy
  - Connecticut Natural Gas Corporation
  - Corning Natural Gas Corporation
  - Laclede Gas Company
  - Maine Natural Gas
  - Questar Gas Company
  - Southern Connecticut Gas Company
  - Oil and Natural Gas Corporation Ltd. (ONGC)

2007 Technology Transfer

2007 Technology Transfer Workshops

Production

- College Station, TX, May 17
- Long Beach, CA, August 21-22
- Glenwood Springs, CO, September 11
- Durango, CO, September 13
- STARtracker Webcast, September 26

Processing

- Calgary, Alberta, Canada, January 15-17
- Houston, TX, April 24, 2007

Methane to Markets

- Multi-sector International Workshop, New Delhi, India, February 22-23

Upcoming Workshops

- **Web casts**
  - Distribution: November 8, 2007
  - Transmission: December 18, 2007
- **Methane to Markets**
  - Project Expo, Beijing, China Oct. 30-Nov. 1, 2007

For more information and 2008 workshop announcements:
http://www.epa.gov/gasstar/workshops.htm

Natural Gas STAR International

- Natural Gas STAR International launched September 26, 2006 – currently has 8 partners.

ConocoPhillips

devon

ENBRIDGE™

ExxonMobil

TransCanada
In business to deliver

Marathon Oil Company

OXY

ओएनजीसी
ONGC

Natural Gas STAR International

- Under the Methane to Markets Partnership, U.S. EPA expanded Natural Gas STAR internationally
- EPA is encouraging existing partners to engage their international operations to voluntarily reduce methane emissions
- **Participation involves:**
  - Developing an implementation plan
  - Identifying and implementing cost-effective projects
  - Reporting your success
- **Support from Gas STAR International is available:**
  - Identify top cost-effective methane reduction project opportunities
  - Conduct project pre-feasibility analysis
  - On-site training and workshop development

New Program Resources and Services and Future Initiatives

New Tools

- **Emission Reduction Quantification Guide:** for Gas STAR recommended technologies and practices

- **STARtracker:** new methane emission reduction tracking tool, donated by Devon - now available on CD.

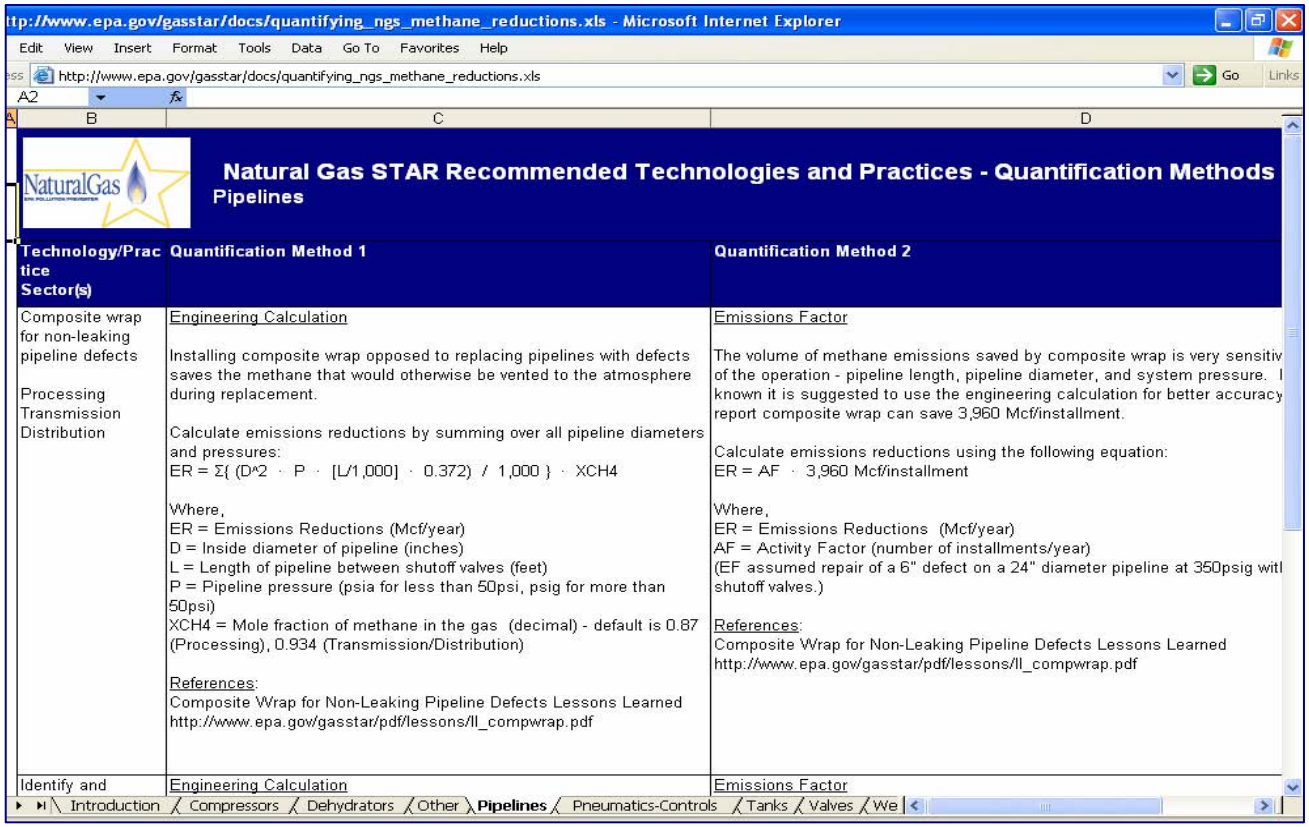
- **New Vender Directory:** Online directory of venders who offer methane emission reduction technologies and services for the oil and gas sector

- **Your feedback is important!**

www.epa.gov/gasstar

Emission Reduction Quantification Guide

- **Guidance for quantifying methane emission reductions from recommended technologies and practices:**



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

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

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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	Engineering Calculation Installing composite wrap opposed to replacing pipelines with defects saves the methane that would otherwise be vented to the atmosphere during replacement. Calculate emissions reductions by summing over all pipeline diameters and pressures: ER = Σ{ (D^2 · P · [L/1,000] · 0.372) / 1,000 } · XCH4 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) References: Composite Wrap for Non-Leaking Pipeline Defects Lessons Learned http://www.epa.gov/gasstar/pdf/lessons/ll_compwrap.pdf	Emissions Factor The volume of methane emissions saved by composite wrap is very sensitiv of the operation - pipeline length, pipeline diameter, and system pressure. I known it is suggested to use the engineering calculation for better accuracy report composite wrap can save 3,960 Mcf/installment. Calculate emissions reductions using the following equation: ER = AF · 3,960 Mcf/installment 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 witl shutoff valves.) References: Composite Wrap for Non-Leaking Pipeline Defects Lessons Learned http://www.epa.gov/gasstar/pdf/lessons/ll_compwrap.pdf
Identify and	Engineering Calculation	Emissions Factor

Introduction | Compressors | Dehydrators | Other | Pipelines | Pneumatics-Controls | Tanks | Valves | We

STARtracker

- **Web based application for tracking methane emission reduction activities under Gas STAR**
  - Ability to centralize data across company
  - Users can input and access data from various locations
- **Developed and donated by Devon – available on CD free to Gas STAR Partners and other interested parties**

Service Provider Directory

- Web page now available – relevant service providers can submit information to be considered for the directory

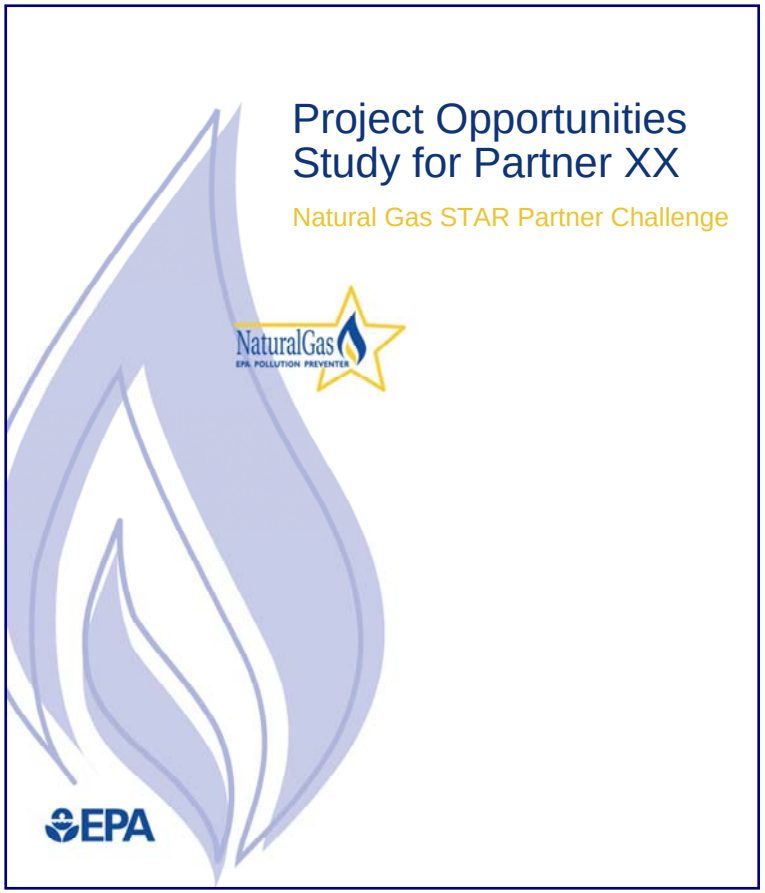
- Searchable list of service providers who offer methane emission reduction technologies and services for the oil and gas sector

Available on the Gas STAR Web site under Documents, Tools and Resources
http://www.epa.gov/gasstar/resources/service_directory.htm

Natural Gas STAR "Partner Challenge"

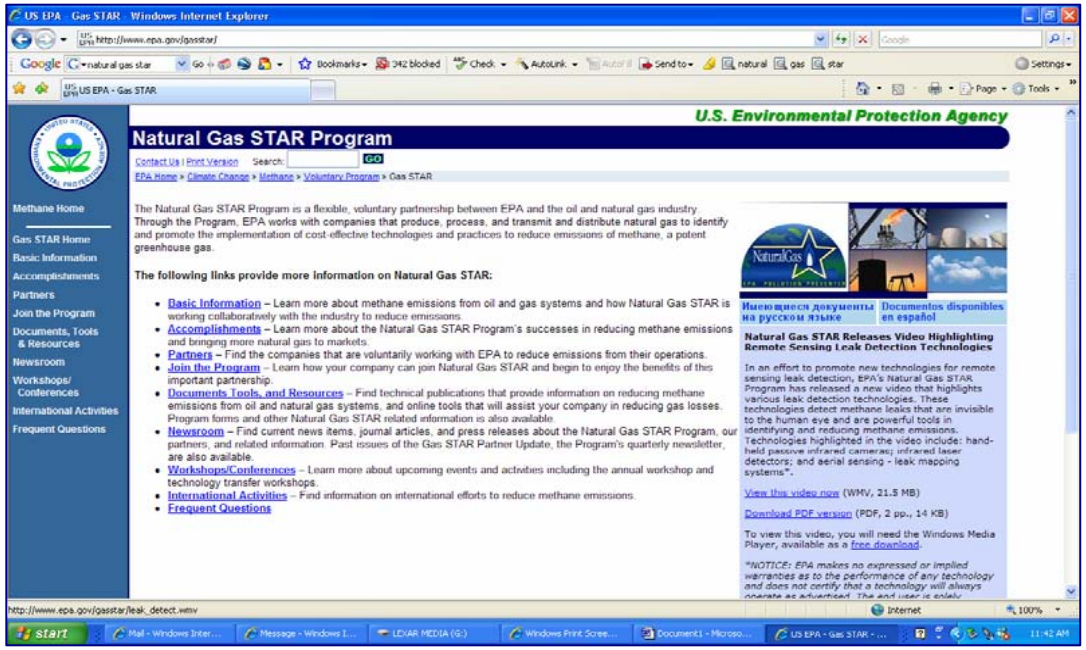
New Service: "Partner Challenge"

- EPA offers assistance to partners in developing estimates of methane emissions and major sources for purpose of identifying and prioritizing new emission reduction opportunities:
  - **Uses customized data**
  - **Details project opportunities and emission reduction potential**
  - **Details economic, operational, and environmental benefits of recommended technologies & practices**



Communications Tools/Materials Upgrade

- **Extensive effort underway to update and improve Gas STAR communications tools and materials and web site**
- **Goal: to make the tools and resources more useful to Partners**
  - Updated tools and resources tailored to new vs mature partners
  - Improved samples and templates
  - Interactive web based guides and new vender directory
- **Your feedback is important!**



Introduction to 14th Annual Workshop

Key Themes

In a time of heightened interest in greenhouse gases, such as methane, new and innovative approaches to making an impact:

- **Greenhouse Gas Management Programs and Strategies**
  - Climate policy update and innovative partner approaches
- **Concurrent Sessions: new, proven methods to capture methane emissions**
  - Production, processing, transmission/distribution
- **Advanced Technologies and Practices to Detect Leaks**
  - Remote sensing technologies and Directed Inspection and Maintenance
- **Keynote Speakers**
  - Janet Peace, PEW Center on Global Climate Change
  - Judith Moorad, Shell Oil Company

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- www. epa.gov/gasstar
- www.methanetomarkets.org