

EPA's Natural Gas STAR Program Overview

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U.S. EPA, Natural Gas STAR Program

Denver, Colorado, February 11, 2014

Park City, Utah, February 13, 2014

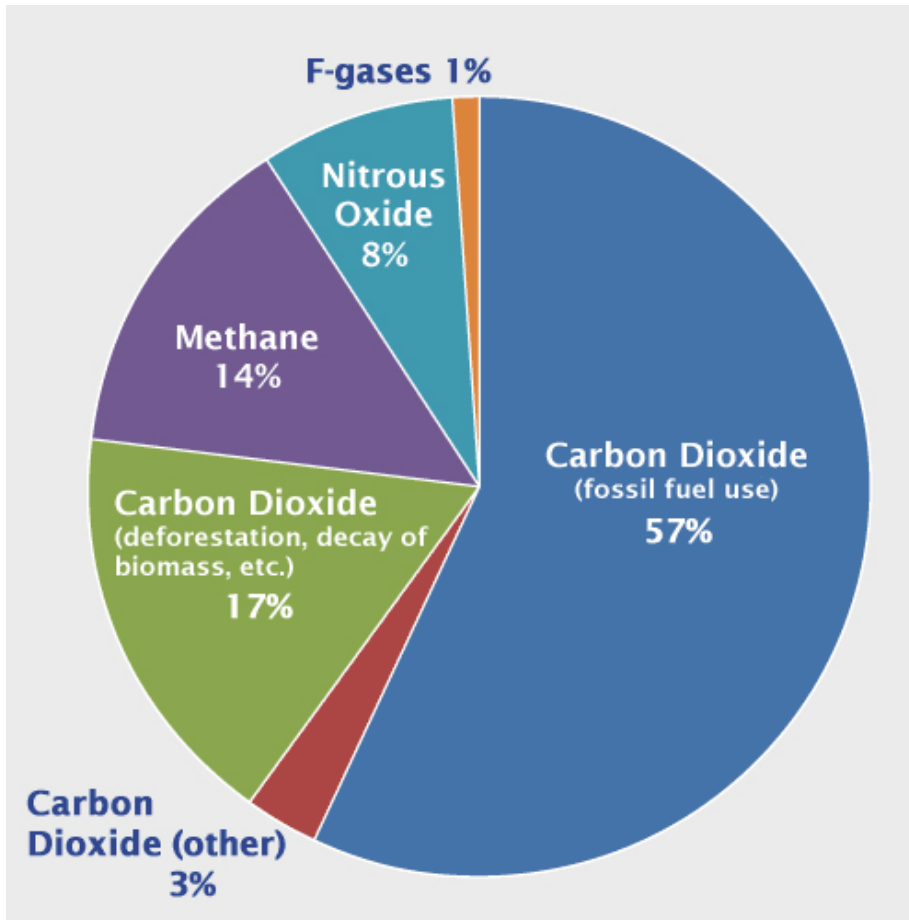


NaturalGas
EPA POLLUTION PREVENTER

Anthropogenic Global Gas Emissions Contributing to Climate Change



Global GHG Emissions by Gas



Key GHGs Emitted by Human Activities

Carbon dioxide (CO₂)

Methane (CH₄)

Nitrous oxide (N₂O)

Fluorinated gases (F-gases)

Industrial processes, refrigeration, and the use of consumer products contribute to emissions of F-gases, which include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

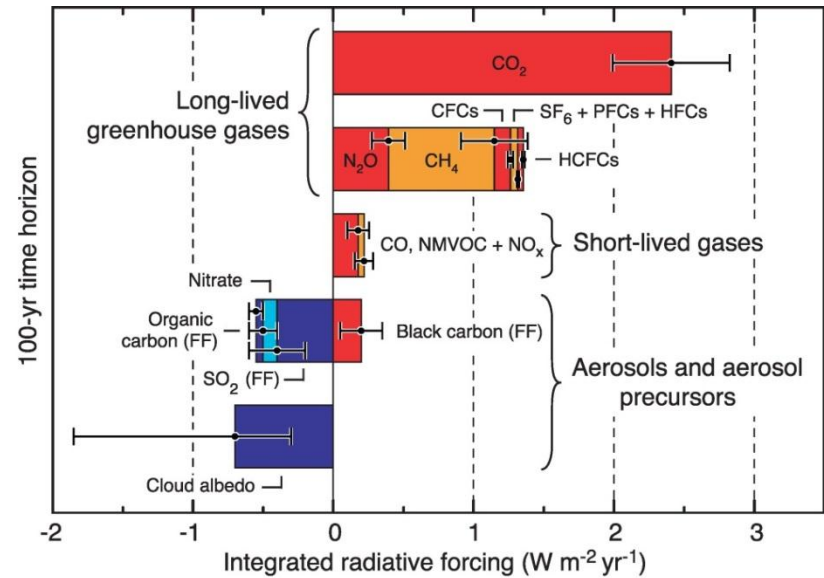
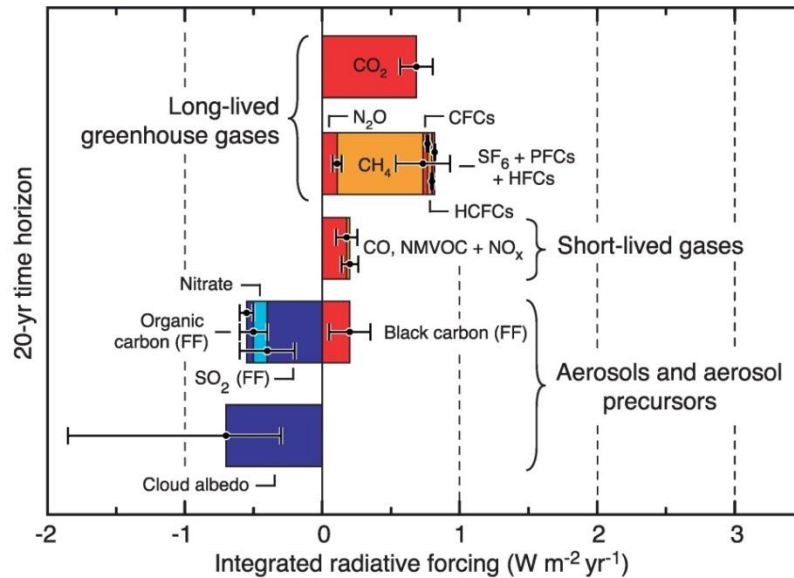
Source: IPCC (2007); summarized at <http://www.epa.gov/climatechange/ghgemissions/global.html>

Future Climate Impact of Current Emissions (20-year versus 100-year)



20-Year*

100-Year*

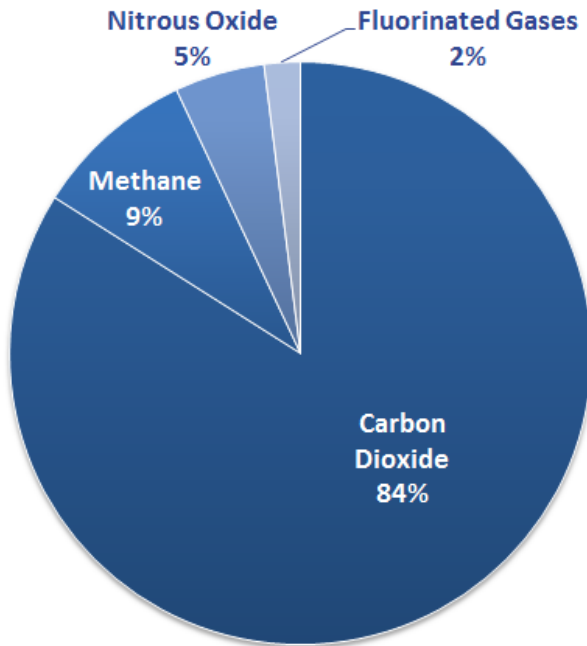


*Source: Adapted from IPCC (2007), <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf>, Chapter 2, page 206

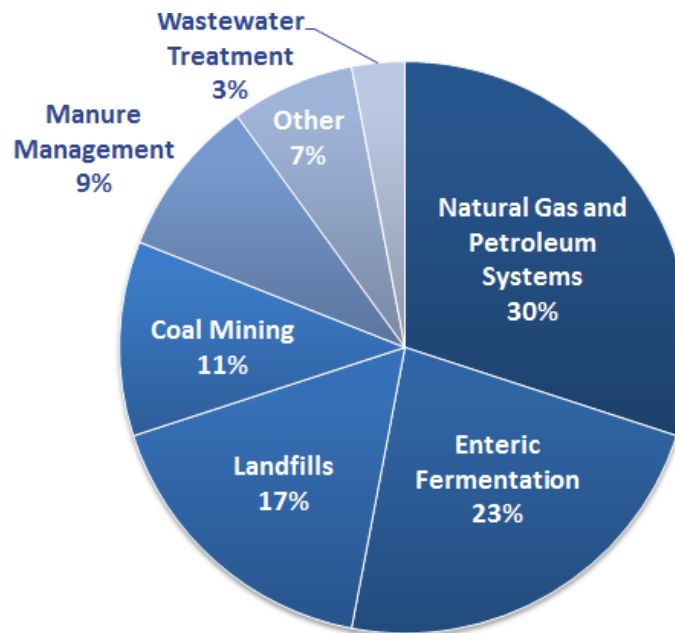
Current US GHG Emissions Estimates



U.S. GHG Emissions All Sources



U.S. Methane Emissions By Source



Oil and natural gas systems are the largest man-made source of methane emissions in the U.S. (30%).

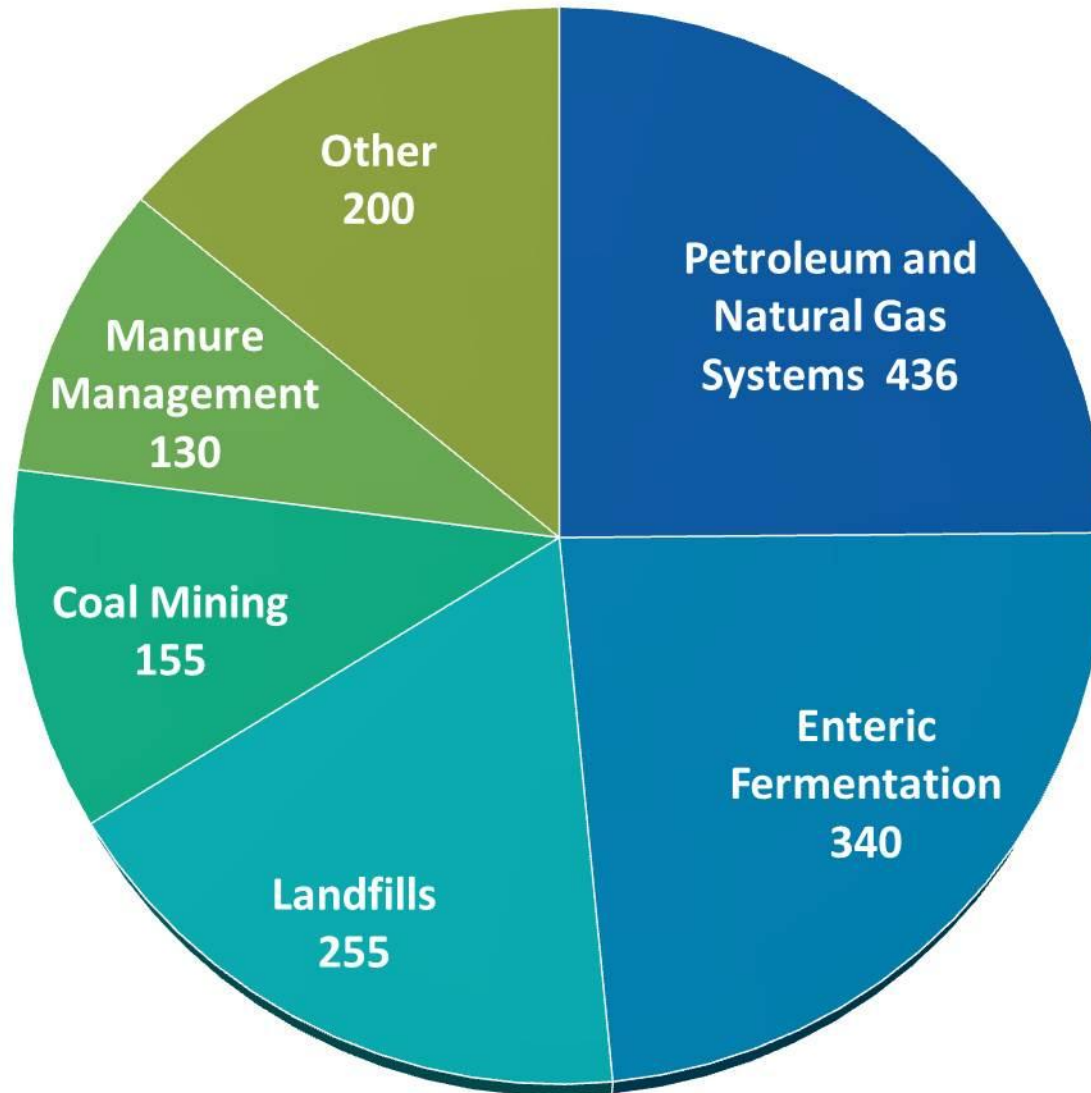
Methane emissions from oil and natural gas systems make up about 3% of total U.S. GHG emissions.

Source: EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011*. April 2013.

Why Methane?

- **Potent greenhouse gas**
 - 100 year GWP = 21
 - Lifetime = 12 years
 - Most important short-lived forcer— based on emissions, accounts for >1/3 of current anthropogenic forcing
- **Ozone precursor**
 - Affects ground-level ozone levels
- **Clean energy source – primary component of natural gas**
- **Many emission sources**
 - Oil & gas, agriculture & waste sectors
 - 50 - 70% of which are anthropogenic
- **Concentration of methane in the atmosphere has increased by 150% in the last 260 years**

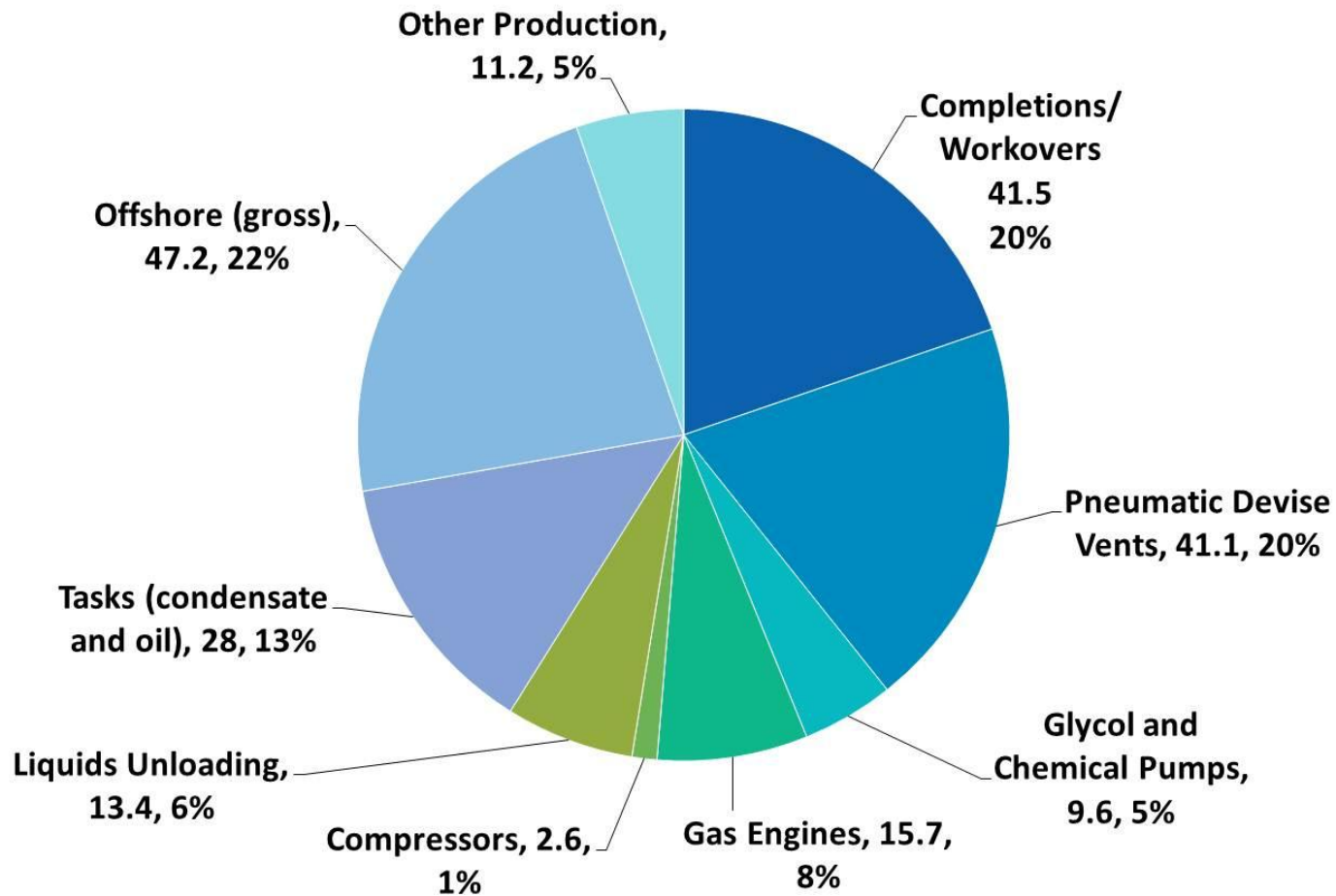
2011 U.S. Human-Made Methane Emissions by Industry (BCF)



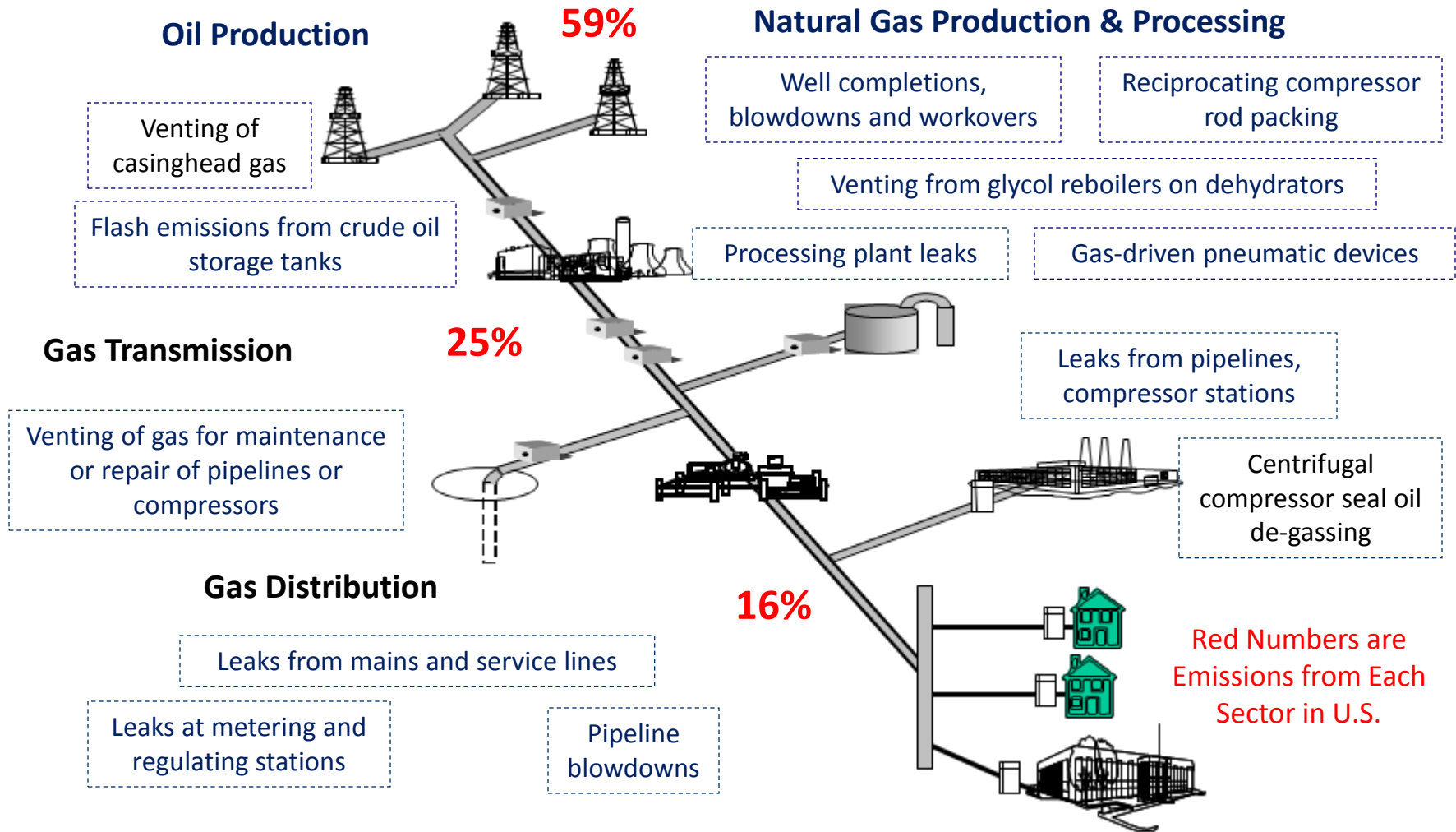
Production Sector Emissions (2011, Bcf)



Total Emissions: 210.3 Bcf



Sources of Methane Emissions from Oil and Gas Operations



Picture courtesy of American Gas Association
 Values Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011, April 2013

Methane Projects Deliver Significant Co-Benefits

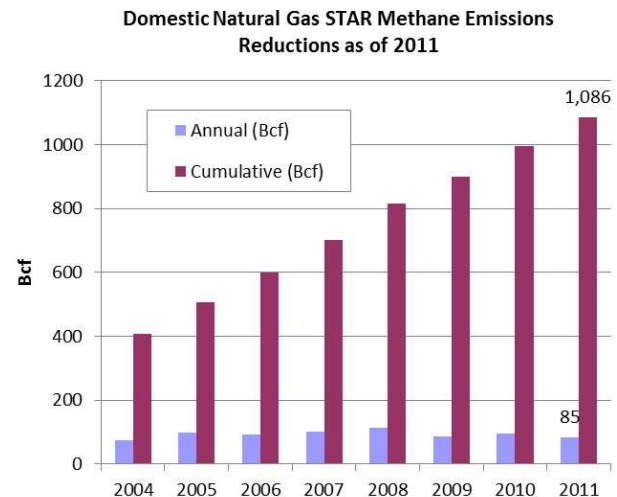


- **New Sources of Clean Energy**
 - Emission capture makes methane available for local energy generation
- **Air Quality Improvement**
 - Decrease in ground-level ozone
 - Reduction of local emissions of VOCs and HAPs
- **Industrial Safety**
 - Methane is explosive – improved worker safety

Natural Gas STAR Program



- **Started in U.S. in 1993 to increase awareness of methane emission sources and share innovative means of reducing them**
 - Expanded internationally in 2006 as part of GMI
- **Over 120 domestic and international partners have**
 - Identified over 50 cost-effective technologies and practices to reduce methane emissions
 - Reduced methane emissions by more than 1 trillion cubic feet (Tcf), saving more than U.S. \$3 billion



Natural Gas STAR Resources



- **Resources to advance cost-effective oil & gas sector methane emission reductions:**
 - General technology transfer, training, and capacity building
- **Technical documents and research outlining over 50 mitigation options, including analyses of economic, environmental and operational benefits**
- **Workshops and Conferences**
- **Individual assistance to assess project opportunities**
 - Estimated methane emission inventories
 - Measurement studies
 - Mitigation project feasibility studies
- **Services and resources provided free of charge and at no obligation**

Over 50 Cost-Effective Methane Reduction Opportunities



Pneumatics/Controls

Document Title	Capital Costs	Production	Gathering and Processing	Transmission	Distribution
Estimated Payback: 0-1 year					
Convert Gas Pneumatic Controls to Instrument Air Lessons Learned (PDF) (12 pp, 314K)	> \$50,000	X	X	X	X
Estimated Payback: 1-3 years					
Options for Reducing Methane Emissions From Pneumatic Devices in the Natural Gas Industry Lessons Learned (PDF) (12 pp, 201K) Presentation (PDF) (20 pp, 384K) November 2011	< \$1,000	X	X	X	X
Convert Pneumatics to Mechanical Controls PRO Fact Sheet #301 (PDF) (3 pp, 204K)	\$1,000-\$1				
Convert Natural Gas-Driven Chemical Pumps PRO Fact Sheet #202 (PDF) (3 pp, 130K)	\$1,000-\$1				
Replacing Gas-Assisted Glycol Pumps with Electric Pumps Lessons Learned (PDF) (17 pp., 197K)	\$1,000-\$1				

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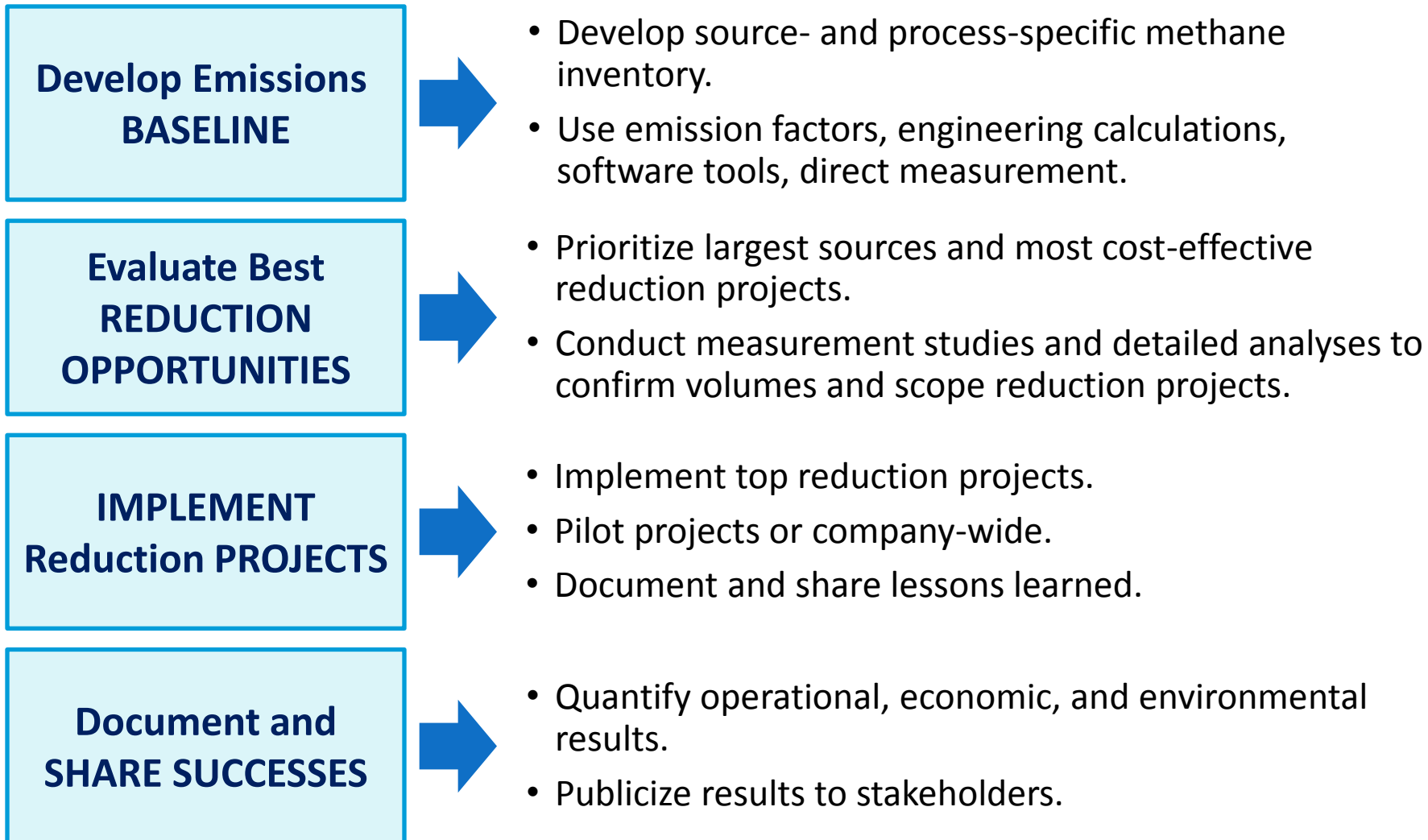
Tanks

Document Title	Capital
Estima	
Convert Water Tank Blanket from Natural Gas to Produced CO ₂ Gas	\$1,000-\$1

- **Low implementation costs**
 - 50% cost <\$5,000 to implement
 - 25% <\$1,000 to implement
- **Quick payback times (\$3/Mcf)**
 - 50% pay back in <1 year
 - 67% pay back in <2 years
- **Low cost per Mcf or tCO₂e reduced**
 - 70% cost <\$3 per Mcf reduced
 - 70% cost <\$10 per tCO₂e reduced

Screenshot from EPA Gas STAR website

Strategy for Addressing Methane Emissions

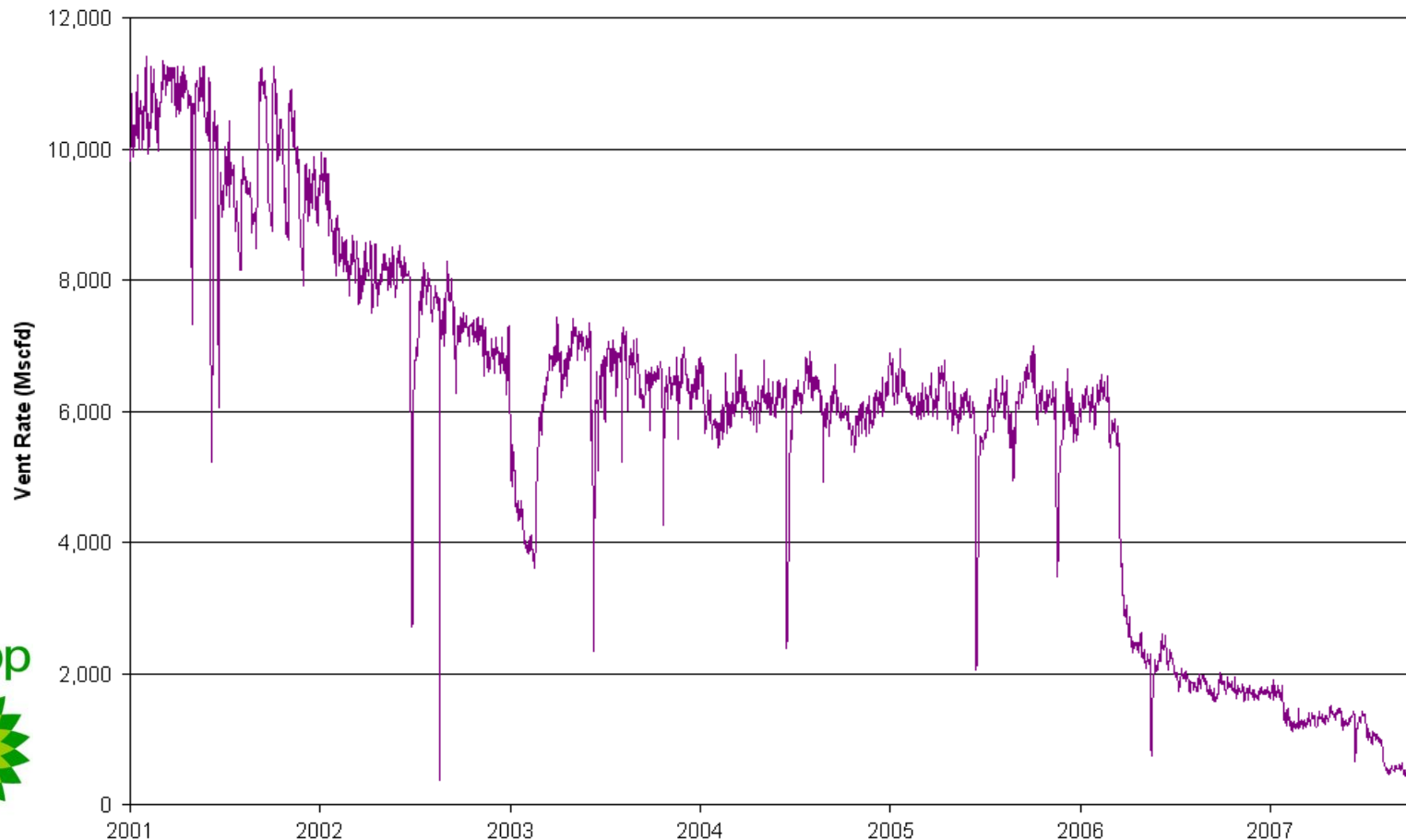


Industry Experience – Well Unloading



Well Venting Reduction Using Plunger Lifts and Smart Automation

Daily Vent Volumes



Industry Experience – Pneumatics



- Chesapeake retrofitted controllers with Mizer low bleed components
- Total 2,670 retrofits done through March 31, 2009
 - Cost: U.S.\$1,447,140
 - Methane Reductions: 18 million m3
 - 7 month simple payback reported using Chesapeake's gas value of ~\$3.50/MMBtu



Fisher 2500, 2506
Retrofit w/ Mizer, bracket,
tubing & relay plug



Cemco/WellMark 6900
Retrofit w/ Mizer Valve



Industry Experience – Pneumatics



U.S. District	Retrofits Done Thru 31-Mar-09	Daily Reduction (thousand m ³)	Annual Reduction (million m ³)
Anadarko	1,264	25.1	9.2
Arkansas	100	2.0	0.7
North Mid-Continent	467	9.3	2.8
Southern Oklahoma	372	7.4	2.8
West Mid-Continent	47	0.9	0.4
Gulf Coast	161	3.2	1.2
Louisiana	17	0.3	0.1
North Permian	93	1.8	0.7
South Permian	149	2.9	0.6
Total	2,670	52.9	18.4

Using \$3.50/MMBtu, the simple payback is 7 months.



Industry Experience – VRUs



- **Payback economics – project for 9 tank batteries**

- Purchase price for 9 VRUs U.S.\$475,000
- Estimate install cost U.S.\$237,500
- Total capital costs U.S.\$712,500

- **Approximate Gas Revenue**

- 29.7 Mcm/day x \$100/Mcm* x 30 days = U.S.\$89,100/ month
- Payback on capital investment < 8 months
- Installed in 2005 & early 2006 – all locations continue to generate incremental revenue and meet environmental compliance goals today

*U.S.\$100/Mcm \approx U.S.\$3/Mcf



Become a Natural Gas STAR Partner



- **Benefits**

- Information sharing and tech transfer
- Technical guidance, including assistance conducting economic analyses related to the implementation of cost-effective technologies and practices
- Peer networking
- Voluntary record of reductions
- Public recognition

- **Requirements**

- Annual reporting of voluntary methane emission reduction activities



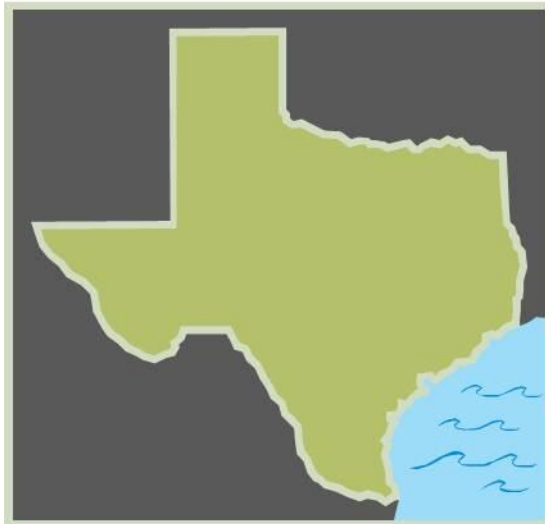
Partnership is open to companies operating in the United States and abroad.

Steps to Join:

1. Sign and send in an MOU
2. Coordinate with EPA to plan your participation and implementation strategy

Learn more at www.epa.gov/gasstar/join/

SAVE THE DATE!



Natural Gas STAR Annual Implementation Workshop

May 12-14, 2014
Grand Hyatt San Antonio
San Antonio, TX

Learn more at:

www.epa.gov/gasstar/workshops/annualimplementation/2013.html

Contact Information



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