EPA Natural Gas STAR Program Accomplishments

Introduction

Established in 1993, the Natural Gas STAR program is a partnership between the U.S. EPA and the oil and natural gas industry designed to cost-effectively reduce methane emissions from voluntary activities undertaken at oil and natural gas operations both domestically and abroad. Having partnered with the oil and gas industry for 14 years, EPA has helped partners implement voluntary, cost-effective methane reduction technologies and practices to save money and improve operational efficiency. Technology transfer is an integral part of the Program. Partners implement a variety of technologies and practices to reduce methane emissions and, by reporting, share these with EPA and other partners who may benefit from the voluntary implementation of similar technologies and practices.

Methane is a potent greenhouse gas 21 times stronger than carbon dioxide. As the primary component of natural gas, methane is also a valuable clean energy source, and reducing emissions to the atmosphere improves partner companies' bottom line while adding to domestic and international natural gas supply. Many recommended technologies and practices also result in additional benefits such as lower operating and maintenance costs, increased operational efficiency and improved safety. By working together to prevent gas losses, EPA and the oil and natural gas industry are successfully protecting the environment and improving profitability.

Natural Gas STAR industry partners have operations in all of the major industry sectors—production, processing, transmission, and distribution—and represent 62 percent of the natural gas industry in the U.S., including 23 of the top 25 U.S. natural gas production companies. Also, with the launch of Natural Gas STAR International in 2006, the Program expanded to include operations around the world, significantly increasing opportunities to reduce methane emissions from natural gas operations worldwide.

Today, the Program has nearly 120 partner companies and is endorsed by 20 major industry trade associations.

Methane Emission Reduction Technologies and Practices

Technologies and Practices

Natural Gas STAR partners are leaders in their field, voluntarily implementing new technologies and practices for reducing methane emissions from their operations. Gas STAR partners share these new technologies and practices with EPA and other partners, making technology transfer a critical component of the Program. The following diagram shows some of the top methane emission reduction opportunities for each sector.

Gas Production & Processing

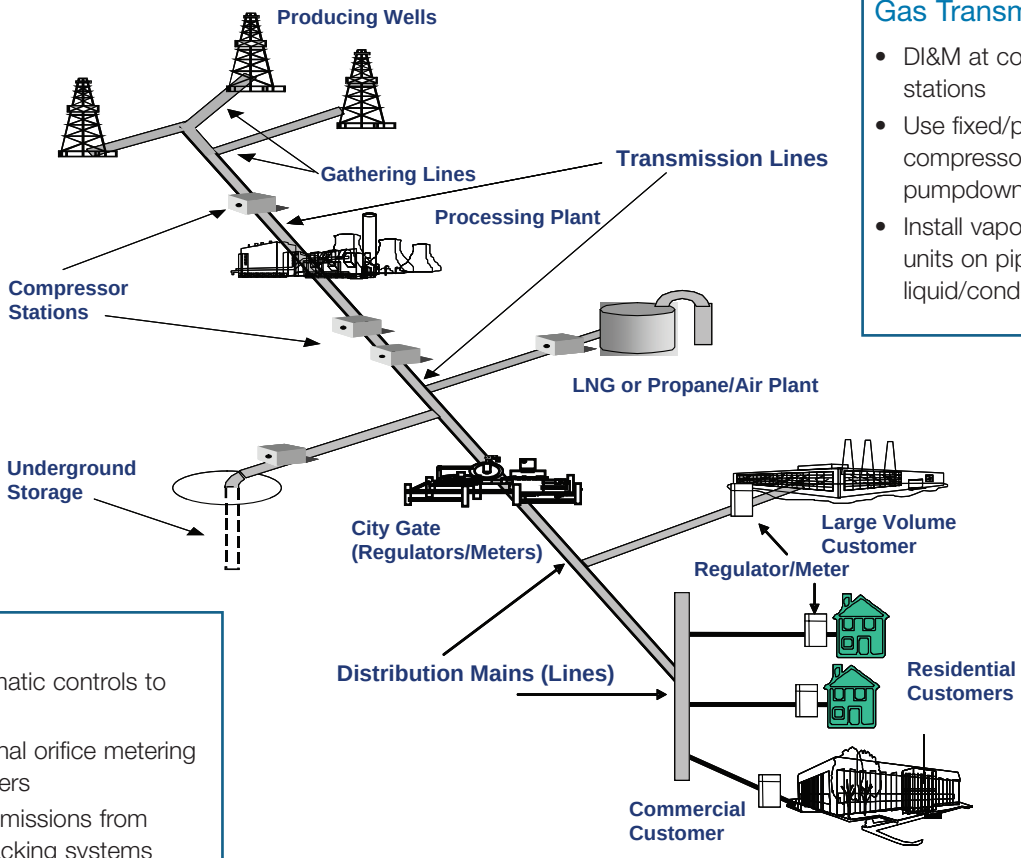
- Perform reduced emissions completions
- Install plunger lifts
- Aerial leak detection using laser and/or infrared technology
- Eliminate unnecessary equipment and/or systems

Oil Production

- Install VRUs on crude oil storage tanks
- Route casinghead gas to VRU or compressor for recovery & use or sale

Gas Transmission

- DI&M at compressor stations
- Use fixed/portable compressors for pipeline pumpdown
- Install vapor recovery units on pipeline liquid/condensate tanks



Gas Storage

- Convert gas pneumatic controls to instrument air
- Replace bi-directional orifice metering with ultrasonic meters
- Reduce methane emissions from compressor rod packing systems

Gas Distribution

- DI&M at surface facilities
- Identify and replace high-bleed pneumatic devices
- Survey and repair leaks

Picture courtesy of American Gas Association.

2006: Continuing Excellence

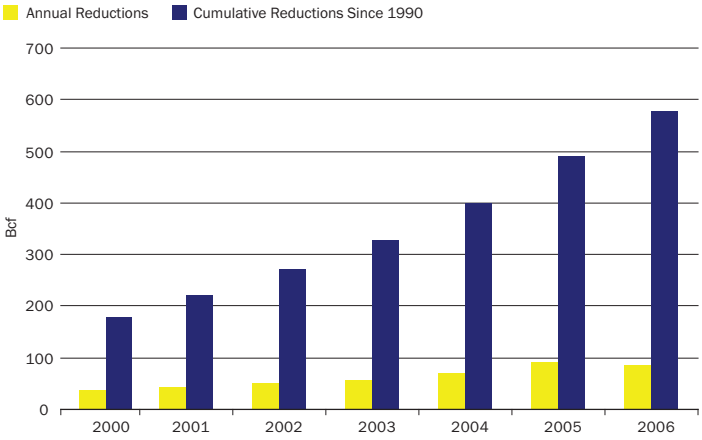
Emissions Reductions

Now in its 14th year, the Natural Gas STAR Program continues to achieve great successes. Gas STAR partners have eliminated more than 577 billion cubic feet (Bcf) of methane emissions through the implementation of more than 120 cost-effective technologies and practices. For calendar year 2006, Gas STAR partners reported emissions reductions of approximately 85.9 Bcf. These emission reductions, voluntarily undertaken by Natural Gas STAR partner companies, have cross-cutting benefits on domestic energy supply, industrial efficiency, revenue generation and greenhouse gas emission reductions. The 2006 voluntary emissions reductions are equivalent to:

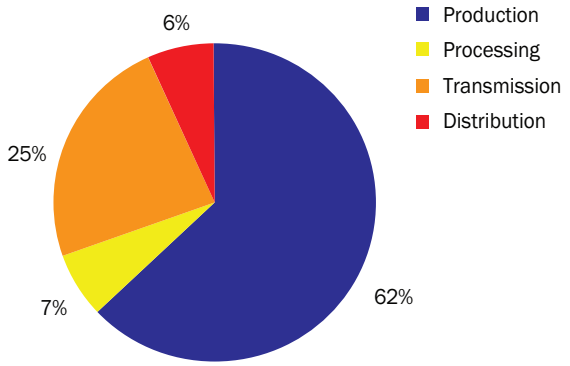
- Additional revenue of more than $600 million in natural gas sales (assumes 2006 average gas price of $7.00 per thousand cubic feet).
- The global warming equivalent of
  - — Removing approximately 7.5 million cars from the road for one year.
  - — 28.9 million acres of pine or fir forests storing carbon for one year.

2006 was a very successful year for Natural Gas STAR with reported emissions reduction of approximately 85.9 Bcf. The production and transmission sectors accounted for the most emissions reduced with 53.7 Bcf and 20.5 Bcf respectively.

Natural Gas STAR Emissions Reductions



2006 Emissions Reductions by Sector (85.9 Bcf)



New Tools and Resources

Natural Gas STAR also introduced several new tools and services available to further the goals of identifying, analyzing and promoting methane emission reduction activities in the oil and gas sector.

- **Emission Reduction Quantification Reference Guide:** In order to help Gas STAR partners and other stakeholders better quantify emission reductions achieved through participation in the Program, EPA has developed a new reference guide to provide assistance in quantifying the methane emission reductions achieved by a particular technology or practice. Where applicable, the Emission Reduction Quantification Reference Guide provides viable calculation methodology options for direct measurement, engineering calculation, and/or emission factors for Gas STAR recommended technologies and practices. The Emission Reduction Quantification Reference Guide is available under the Forms section of the Documents, Tools and Resources section of the Natural Gas STAR Web site at epa.gov/gasstar/resources/forms.htm.
- **Partner Challenge Service:** The goal of the Natural Gas STAR Partner Challenge service is to assist Partner companies in identifying and implementing new methane reduction opportunities by developing estimates of a partner's methane emissions, identifying key emission sources, and proposing economically and environmentally beneficial mitigation activities. The end product is a detailed report that quantifies methane emissions volumes by source and provides detailed economic and emissions analyses for implementing targeted emission

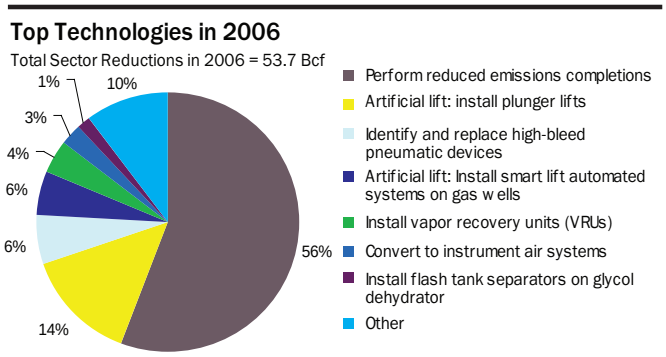
reduction technologies or practices. This service is provided free of charge and in no way obligates participating companies to undertake recommended emission reduction activities.

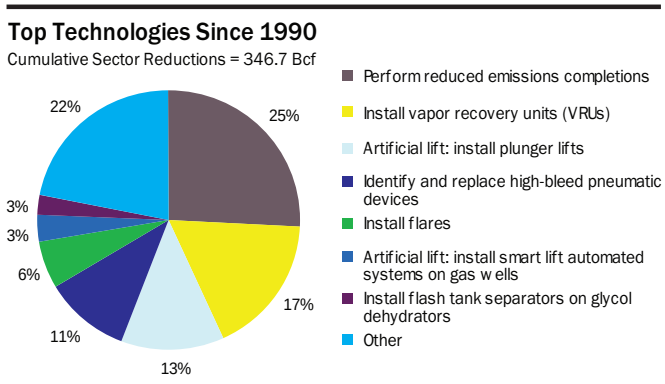
- **STARtracker, A New Methane Emissions Reduction Tracking Tool:** Devon Energy Corporation (Devon), in collaboration with COMM Engineering (COMM) and Louisiana State University (LSU), has developed STARtracker, a Web-based application for tracking and reporting methane emission reductions. The application, to be hosted on individual companies' Web servers, allows users to set up the tool to reflect their operations in order to track and catalog methane emission reductions across their company. To date, Devon has found STARtracker to be an effective tool in managing the data associated with its emission reductions and has generously donated the application to the Natural Gas STAR Program to share with other interested Partners. To request a copy of STARtracker on CD, please contact Suzie Waltzer at (202) 343-9544 or waltzer.suzanne@ epa.gov.*

* The Gas STAR Program is providing this open source application free of charge to partner companies and interested parties. This is not an EPA program or document. EPA is distributing this as a courtesy to our partners and interested parties. EPA will NOT provide technical support for installation, training, operation, or further development.

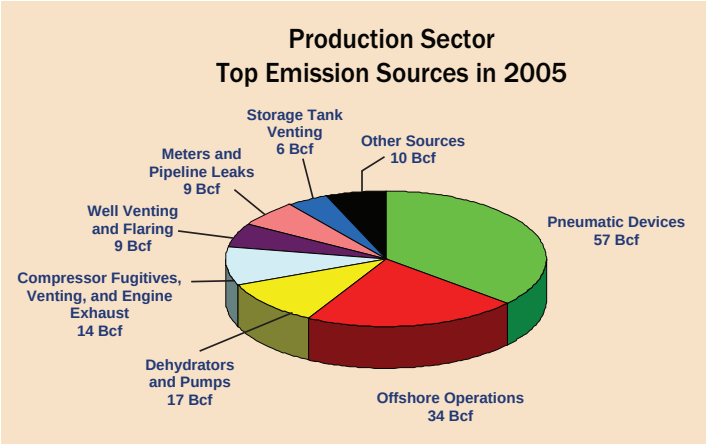
Production Sector Accomplishments

Production partners reported approximately 53.7 Bcf of methane emissions reductions in 2006—and a total of 346.7 Bcf since 1990. The top technologies and practices employed by production sector partners include:



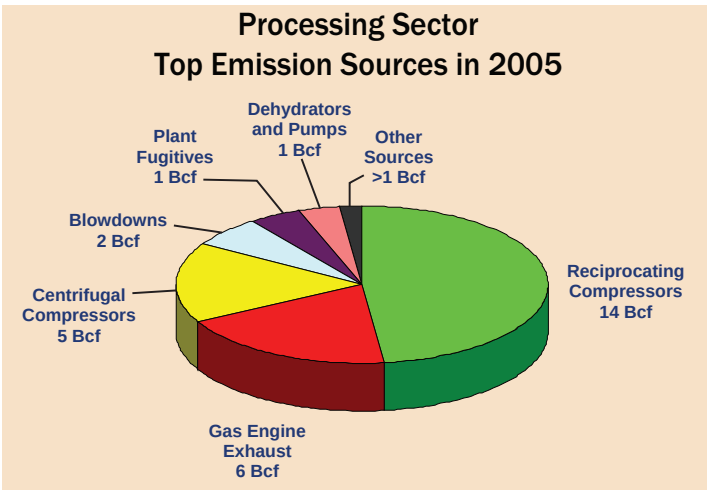


Detailed information on these technologies and practices can be found at epa.gov/gasstar/techprac.htm.



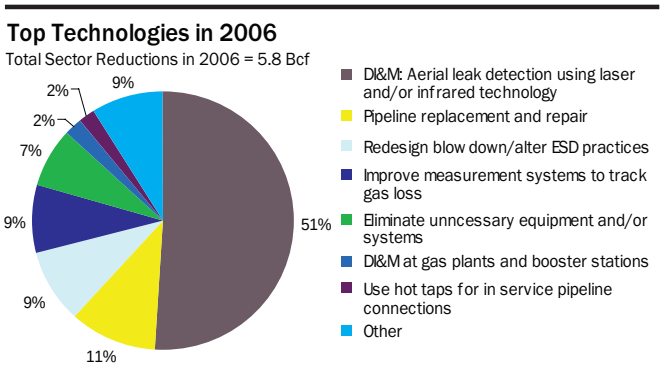
Source: EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2005, April 2007.

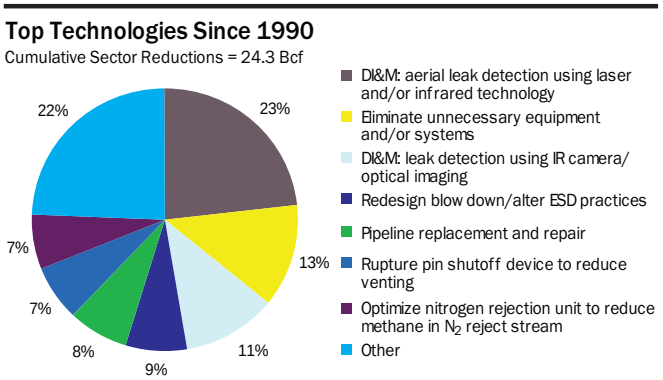
Processing Sector Accomplishments



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

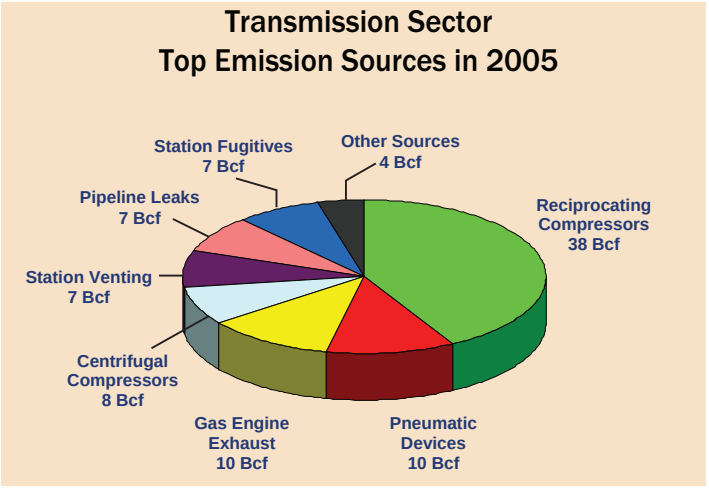
Processing partners reported 5.8 Bcf of methane emissions reductions in 2006—and a total of 24.3 Bcf since 1990. The top technologies and practices employed by processing sector partners include:





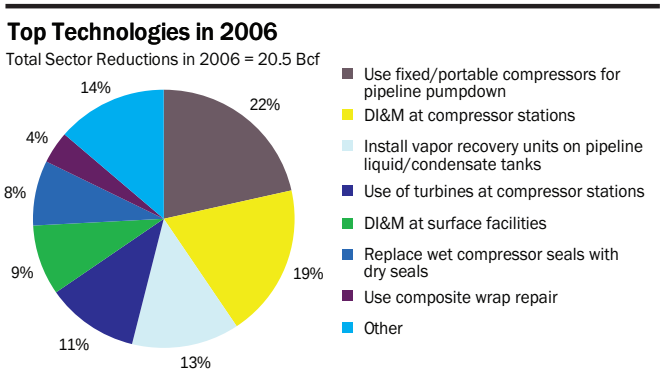
Detailed information on these technologies and practices can be found at epa.gov/gasstar/techprac.htm.

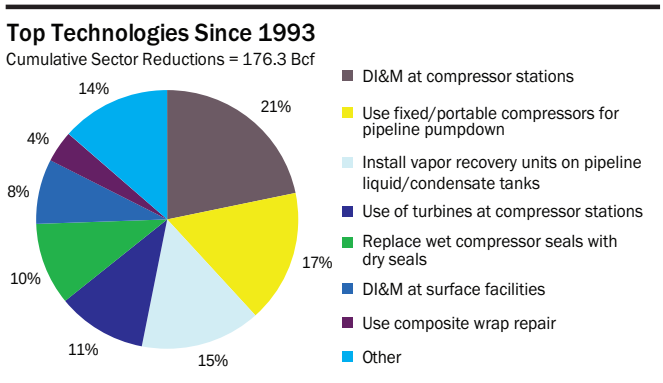
Transmission Sector Accomplishments



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

Transmission partners reported 20.5 Bcf of methane emissions reductions in 2006—and a total of 176.3 Bcf since 1993. The top technologies and practices employed by transmission sector partners include:

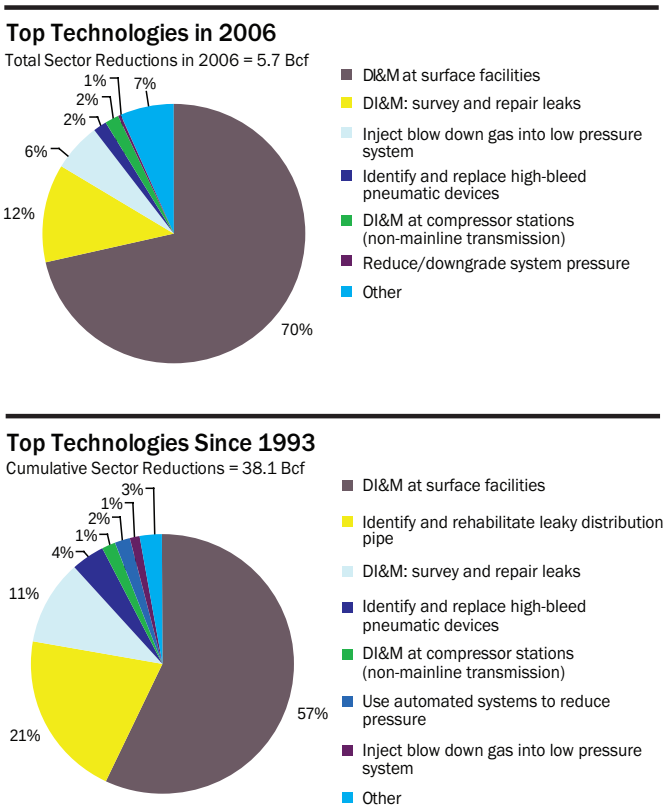




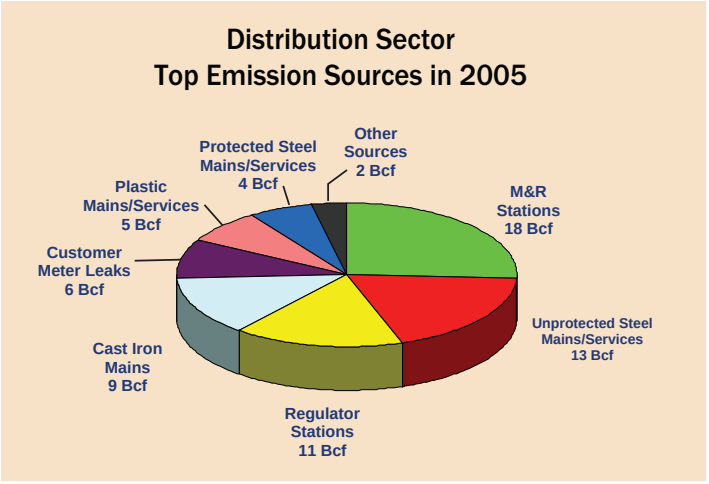
Detailed information on these technologies and practices can be found at epa.gov/gasstar/techprac.htm.

Distribution Sector Accomplishments

Distribution partners reported 5.6 Bcf of methane emissions reductions in 2006—and a total of approximately 38.1 Bcf since 1993. The top technologies and practices employed by distribution sector partners include:



Detailed information on these technologies and practices can be found at epa.gov/gasstar/techprac.htm.



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

Natural Gas STAR Partners and Endorsers

Production

Anadarko Petroleum Corporation
Apache Corporation
BP
CDX Gas
Chevron Corporation
ConocoPhillips Alaska Natural Gas Corporation
ConocoPhillips Petroleum Company
Devon Energy
Dominion Exploration and Production
El Paso E&P Company, L.P.
Encana Oil & Gas (USA) Inc.
Energen Resources
ExxonMobil Production Company
Hess Corporation's Americas Exploration and Production
Hunt Oil Company
Marathon Oil Company
Murphy Exploration and Production Company
Newfield Exploration Company
Noble Energy, Inc.
Occidental Oil and Gas Corporation
Pioneer Natural Resources USA, Inc.
Pogo Producing Company
Quicksilver Resources
Shell Exploration & Production Company
Southwestern Energy Company
Torch Energy
Total E&P USA
Venoco Inc.
Williams Production RMT Company
XTO Energy

Processing

BP
Chevron Corporation
ConocoPhillips
DCP Midstream
Enbridge Energy Partners, L.P.
Enogex, Inc.
Enterprise Products Operating L.P.
ExxonMobil Production Company
ONEOK Field Services
Pioneer Natural Resources USA, Inc.
Targa Resources, Inc.
Western Gas Resources (a wholly owned subsidiary of Anadarko Petroleum Corporation)

Transmission

Alliance Pipeline L.P.
ANR Pipeline Company
Carolina Gas Transmission (a SCANA Corporation Company)
Columbia Gas Transmission Corporation (a NiSource Transmission Company)
Columbia Gulf Transmission Company (a NiSource Transmission Company)
Colorado Interstate Gas Company (an El Paso Transmission Company)
Consumers Energy, Michigan
DTE Energy-MichCon
El Paso Natural Gas Company
Enbridge, Inc.
Florida Gas Transmission (a Southern Union Gas Company)
Granite State Gas Transmission, Inc. (a NiSource Transmission Company
Great Lakes Gas Transmission Company
Gulf South Pipeline
Iroquiois Gas Transmission System
Kinder Morgan
Northern Natural Gas
ONEOK Partners GP, L.L.C.
Pacific Gas and Electric Company
Panhandle Eastern Pipeline (a Southern Union Gas Company)
Piedmont Natural Gas
Public Service Company of New Mexico
Questar Pipeline Company
Sea Robin Pipeline (a Southern Union Gas Company)
Southern California Gas Company
Southern Natural Gas Company (an El Paso Transmission Company)
Spectra Energy Transmission
Tennessee Gas Pipeline Company (an El Paso Transmission Company)
TransCanada-Gas Transmission Northwest
Transwestern Pipeline (a Southern Union Gas Company)
Trunkline Gas (a Southern Union Gas Company)
Williams Gas Pipeline
Williston Basin Interstate Pipeline Company

Distribution

AGL Resources
Alliant Energy
Aquila Networks
Atmos Energy Corporation
Bay State Gas Company (a NiSource Distribution Company)
Berkshire Gas
Central Hudson Gas & Electric Corporation
CenterPoint Energy Arkla/Entex
CenterPoint Energy Minnesota Gas
Citizens Gas and Coke Utility
Columbia Gas of Kentucky, Inc. (a NiSource Distribution Company)
Columbia Gas of Maryland, Inc. (a NiSource Distribution Company)
Columbia Gas of Ohio, Inc. (a NiSource Distribution Company)
Columbia Gas of Pennsylvania, Inc. (a NiSource Distribution Company)
Columbia Gas of Virginia, Inc. (a NiSource Distribution Company)
Connecticut Natural Gas Corporation
Consolidated Edison Company of New York, Inc.
Constellation Energy/Baltimore Gas and Electric Company
Consumers Energy, Michigan
Corning Natural Gas
Delmarva Power
DTE Energy-MichCon
Duke Energy Ohio/Kentucky
Equitable Gas Co.
KeySpan Energy Delivery (a National Grid Company)
Kinder Morgan
Kokomo Gas and Fuel Company (a NiSource Distribution Company)
Laclede Gas Co.
Maine Natural Gas
National Grid
New Jersey Natural Gas Company
New York State Electric & Gas Corporation
Nicor Gas
Northern Indiana Fuel & Light Co. (a NiSource Distribution Company)
Northern Indiana Public Service Company (a NiSource Distribution Company)
Northern Utilities (a NiSource Distribution Company)
Orange and Rockland Utilities
Pacific Gas and Electric Company
PECO Energy Company
Piedmont Natural Gas
PSNC Energy
Public Service Company of New Mexico
Public Service Electric and Gas Company
Puget Sound Energy
Questar Gas Co.
Rochester Gas & Electric Corporation
South Carolina Electric & Gas Company (a SCANA Corporation Company)
Southern California Gas Company
Southern Connecticut Gas Company
Southwest Gas Corporation
UGI Utilities, Inc.
Washington Gas
Wisconsin Public Service Company

International

ConocoPhillips Canada Ltd
Devon Energy Corporation
Enbridge, Inc.
ExxonMobil Corporation
Marathon Oil Corporation
Occidental Oil and Gas Corporation
Oil and Natural Gas Corporation Ltd. (ONGC)
TransCanada

Endorsers

American Exploration & Production Council
The Air & Waste Management Association (A&WMA)
American Gas Association (AGA)
American Institute of Chemical Engineers (AIChE) Institute for Sustainability
American Petroleum Institute (API)
Colorado Oil and Gas Association (COGA)
Gas Processors Association (GPA)
Gulf Coast Environmental Affairs Group (GCEAG)
Independent Petroleum Association of America (IPAA)
Independent Petroleum Association of Mountain States (IPAMS)
Interstate Natural Gas Association of America (INGAA)
Interstate Oil & Gas Compact Commission (IOGCC)
Natural Gas Supply Association (NGSA)
New York State Energy Research and Development Authority (NYSERDA)
Northeast Gas Association (NGA)
Petroleum Association of Wyoming (PAW)
Petroleum Technology Transfer Council
Southern Gas Association (SGA)
Texas Alliance of Energy Producers