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fall 1996



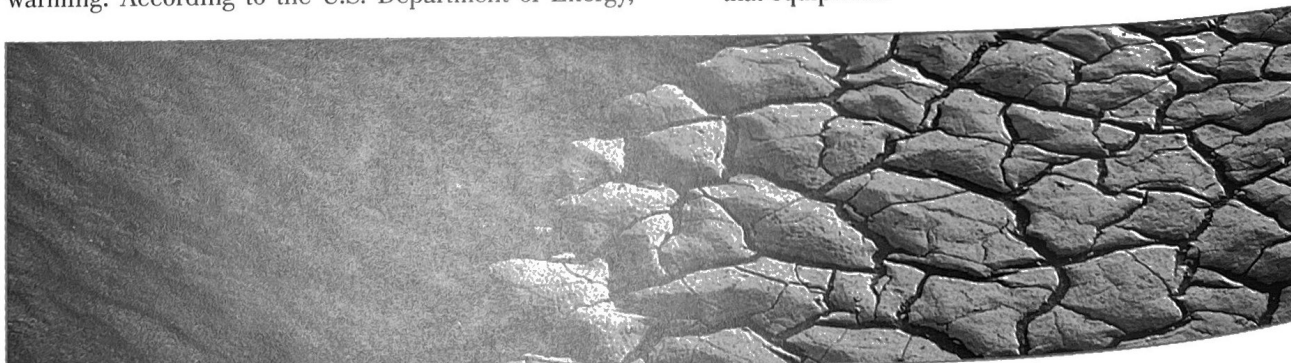
ENVIRONMENTAL

Natural Gas: A Strategy for Reducing Greenhouse Gas Emissions

Many segments of society—including the natural gas industry—are interested in finding ways to reduce emissions of carbon dioxide and other so-called greenhouse gases from human activities that may contribute to global warming. According to the U.S. Department of Energy,

Results of a multi-year joint study recently released by GRI and the U.S. EPA's Office of Research and Development show that natural gas is clearly the best fossil fuel choice for reducing emissions that potentially lead to global warming. And in the process of quantifying those emissions, the study has brought additional benefits to the industry:

- estimates of equipment inventories
- new methods for measuring emissions from that equipment



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Although natural gas is a contributor, it may also be part of the solution. Both the U.S. Environmental Protection Agency (EPA) and the United Nations Intergovernmental

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Panel on Climate Change (IPCC) have recommended increased use of natural gas over other fossil fuels as a way to reduce greenhouse gas emissions. "Natural gas has the lowest carbon dioxide emissions per unit of energy of all fossil fuels," according to a 1995 United Nations report.

- ways to reduce operating costs while reducing emissions.

"When you're looking at strategies to control greenhouse gases, switching to natural gas makes sense," says GRI's project manager for the study, Robert Lott, Principal Technology Manager, Air Quality. "Our analysis shows that natural gas contributes significantly less to potential global warming than coal or oil. That fact supports the fuel-switching strategy suggested by the IPCC, EPA and others." That strategy considers both combustion-related CO₂ emissions and leakage of methane—also a greenhouse gas—from gas equipment.

A key element in the natural gas industry's response to methane emissions is industry participation in EPA's Natural Gas STAR Program. That participation has already reduced methane emissions by 10 Bcf.

"We are delighted with the gas industry's commitment to improving our understanding of this source of methane emissions, and we want to commend the industry for its leadership in profitably reducing emissions through the STAR Program," says Kathleen Hogan, Acting Director of EPA's Atmospheric Pollution Prevention Division. "We look forward to future environmental advances as we continue to expand our knowledge of methane sources and the many cost-effective opportunities to reduce them."

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methane: no drawback

Because methane pound for pound is a more potent greenhouse gas than carbon dioxide, the study sought to determine whether methane *leakage* and *emissions* from the natural gas industry are large enough to substantially reduce or even eliminate the benefits of lower carbon dioxide emissions from natural gas *combustion*.

The GRI/EPA study is significant because it provides a "defensible answer to the question, 'Do methane emissions offset the benefits of using natural gas?' And that answer is 'No,'" says David Kirchgessner, Senior Research Scientist for EPA's Office of Research and Development (ORD).

Kirchgessner, EPA/ORD's project manager for the study, credits GRI and the natural gas industry for their cooperation in gathering data unprecedented in its depth and scope. Based on 1992 operating practices data collected by GRI and EPA, estimated methane emissions from natural gas operations are 314 billion standard cubic feet (Bscf), or 1.4% of gross natural gas production.

"This is a statistically defensible number," Kirchgessner says of the study result, "and the study was so rigorous that I don't believe it will have to be revisited in the foreseeable future."

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Methane emissions are dropping as a result of cooperation among industry, EPA, GRI, and associations such as the American Gas Association and Natural Gas Supply Association. Because the gas industry's voluntary effort to reduce emissions through the STAR Program began after the 1992 baseline year used in GRI's study, resulting reductions in methane emissions are not reflected in the study. Today, the percentage of methane lost from natural gas operations is even lower than the study estimates.

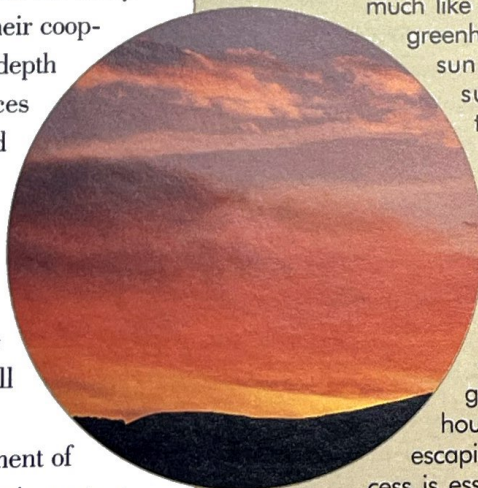
What happens to emissions if natural gas sales increase?

A separate study, conducted by Columbia Gas of Ohio, shows that although increases in throughput will produce higher emissions, the average rise in emissions will be proportionally much smaller than for the current throughput. Depending on the size of the increase in natural gas production, emissions from increased gas sales would only be between 0.5% and 1% of the increased production, compared to 1.4% for the baseline system.

Why? Because the increased throughput would use the excess capacity of the current system, and the new equipment that would be added to support the increase in gas use would use lower-emitting technologies. Examples of cleaner technologies are no-bleed pneumatic devices, turbine compressor engines, and plastic pipe instead of steel and cast iron gas distribution mains.

WHAT'S GLOBAL WARMING?

Global warming refers to the climate change that can result from an increase in the "greenhouse effect" created by gases in the earth's atmosphere that act much like the glass walls and roof of a greenhouse, trapping heat from the sun. Approximately 60% of the sun's energy that passes through the atmosphere is absorbed at the earth's surface. The surface re-radiates this energy at a longer wavelength. Energy at this new wavelength can then be absorbed by greenhouse gases—such as water vapor and carbon dioxide. Like the glass in a greenhouse, greenhouse gases keep this energy from escaping the earth's system. This process is essential to sustain life on Earth, but any increases in greenhouse gases caused by human activity could lead to global warming.



The study examined the consequences of increasing gas sales by 5%, 15%, and 30% under three scenarios: uniform, winter peak, and summer peak load profiles. The most realistic scenario assumes the system will be expanded using the latest, most cost-effective technologies.

During the course of the study, researchers gathered data on the number of pieces of equipment that emit methane and developed new methods of measuring emissions. These new methods included using tracer gas and a new "Hi-Flow™" instrument that provides a quick, cost-effective means of measuring the leak rate of valves, seals, pneumatic devices, and connectors.

Sources of emissions To account for all sources of emissions, the industry was divided into four segments: production, processing, transmission/storage, and distribution. Within each segment, the study identified all potential sources of methane from facilities, equipment, and components. Equipment was divided into types (such as pneumatic controllers, compressors, offshore platforms); mode of operation (start-up, normal, maintenance, upsets, mishaps); and emissions type (leakage, vented, combustion).

Methane emissions from U.S. natural gas operations represent about 19% of all "man-made" U.S. methane emissions. In addition, 32% come from landfills, 19% from domesticated livestock, 15% from coal mining, 9% from livestock manure, and 6% from miscellaneous sources.

Within the natural gas industry, 37% of methane emissions come from transmission and storage activities, 26% from production, 25% from distribution, and 12% from processing.

This chart lists the largest emission sources for each industry segment. Prior to the GRI/EPA study, pneumatic devices were not considered a major source. Based on 1992 practices, data indicated that about one-third of these devices bled natural gas to the atmosphere continuously. Since then, installing improved pneumatics has reduced this source of fugitive emissions.



LARGEST EMISSION SOURCES BY INDUSTRY SEGMENT

Segment	Source	Annual methane emissions (Bscf)	% of total
Production	Pneumatic devices	31	10
	Fugitive emissions	17	5
	Dehydrators	14	4
	Other	22	7
Processing	Fugitive emissions	25	8
	Compressor exhaust	6	2
	Other	6	2
Transmission/ Storage	Fugitive emissions	67	21
	Blow and purge	19	6
	Pneumatic devices	14	4
	Compressor exhaust	11	4
	Other	5	2
Distribution	Underground pipeline leaks	42	13
	Meter and pressure regulating stations	27	9
	Customer meters	6	2
	Other	2	1
TOTAL		314 Bscf	100

(from Methane Emissions from the Natural Gas Industry, Volume I: Project Summary, GRI, August 1996)

Keeping cool International cooperation is helping to combat the threat of global warming. But as a planet, we still have a long way to go. Using clean-burning fuels like natural gas is one relatively painless way for businesses and individuals to make a difference. And the natural gas industry is doing its part to reduce its own greenhouse gas emissions even further. Together, these efforts and those of nations around the globe can help stop global warming, cold.

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