

The Global Methane Initiative and Methane Emission Resources for Oil and Natural Gas Companies

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Roger Fernandez
Team Leader, U.S. EPA
Global Methane Initiative – Oil & Gas
Natural Gas STAR International

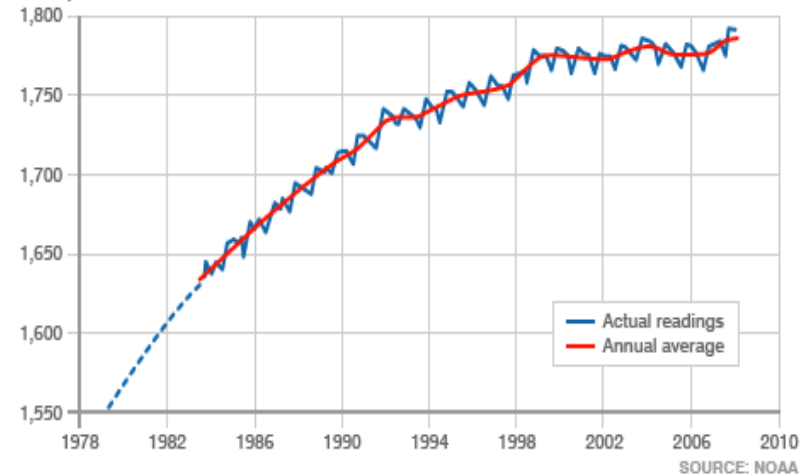


Why Focus on Methane?

- Potent greenhouse gas
 - 20 year GWP = 72
 - Lifetime = 12 years
 - Most important short-lived forcer— based on emissions, accounts for more than 1/3 of current anthropogenic climate forcing
- Ozone precursor
 - Effects background ozone levels
- Clean energy source – primary component of natural gas
- Many emission sources
 - Oil & gas, agriculture & waste sectors
 - 50 – 70% are anthropogenic
- Concentration of methane in the atmosphere has increased by 150% in the last 260 years

RISING METHANE

Parts per billion



SOURCE: NOAA

Scientific Imperative: Avoiding Critical Temperature Thresholds

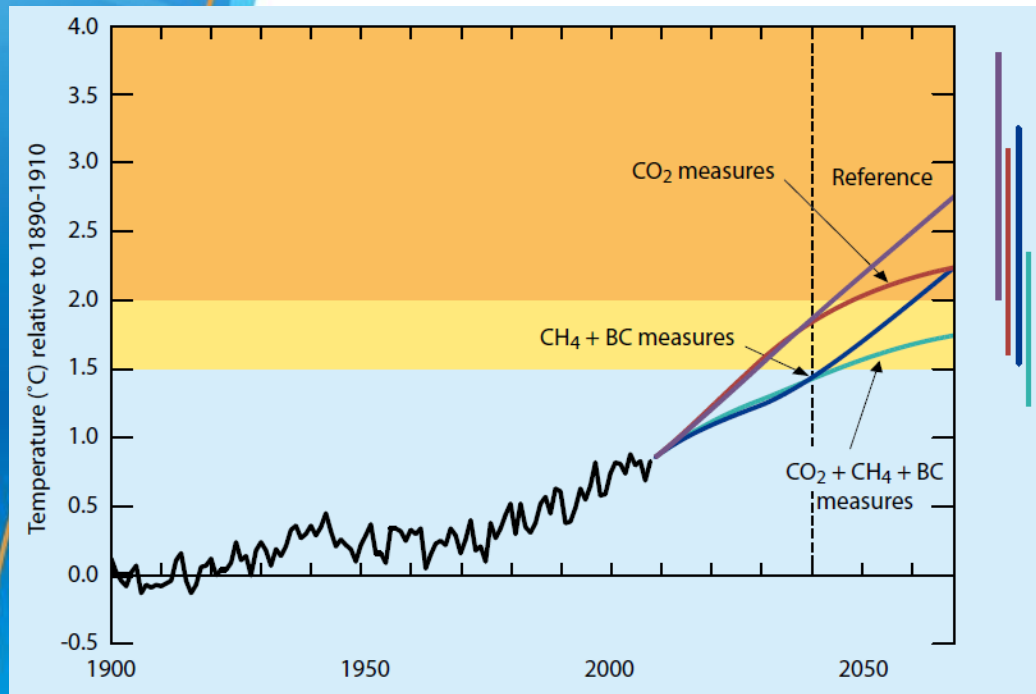


Figure 3. Observed deviation of temperature to 2009 and projections under various scenarios. Immediate implementation of the identified BC and CH₄ measures, together with measures to reduce CO₂ emissions, would greatly improve the chances of keeping Earth's temperature increase to less than 2°C relative to pre-industrial levels. The bulk of the benefits of CH₄ and BC measure are realized by 2040 (dashed line).

Explanatory notes: Actual mean temperature observations through 2009, and projected under various scenarios thereafter, are shown relative to the 1890–1910 mean temperature. Estimated ranges for 2070 are shown in the bars on the right. A portion of the uncertainty is common to all scenarios, so that overlapping ranges do not mean there is no difference, for example, if climate sensitivity is large, it is large regardless of the scenario, so temperatures in all scenarios would be towards the high-end of their ranges.

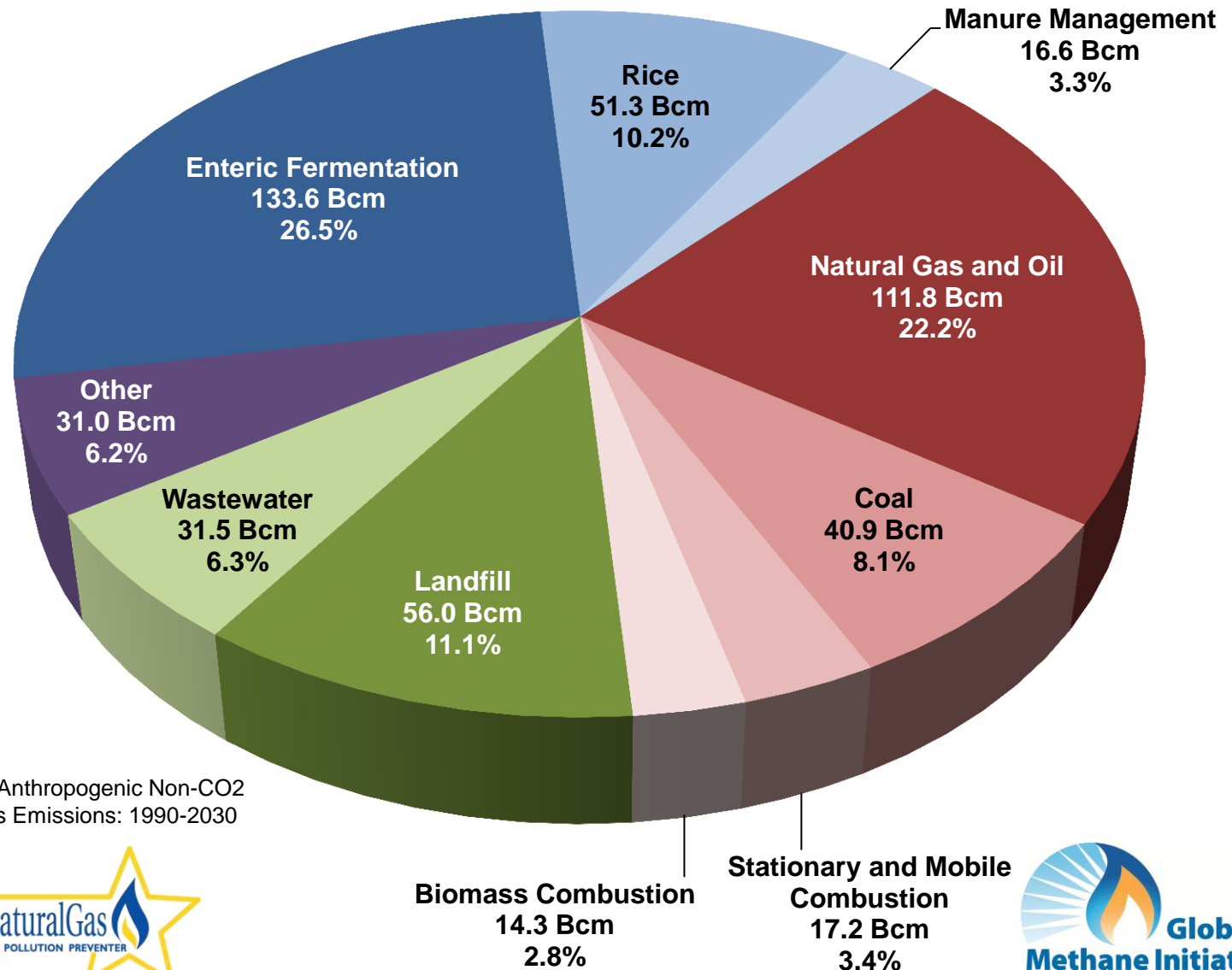
- U.S. supports focused initiative on near-term climate change
 - Short Lived Climate Forcers
 - Black Carbon
 - HFCs
 - CH₄
 - The need to reduce is clear and urgent
 - Mitigation options are available and cost effective



Source: Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers. UNEP & WMO, 2011.



Worldwide Human-Made Methane Emissions (2010)



Source: Global Anthropogenic Non-CO2 Greenhouse Gas Emissions: 1990-2030



Importance of Methane Emissions from Oil & Gas Sector

ECONOMIC LOSS OF A VALUABLE PRODUCT

Over **110 billion m³** of natural gas lost annually by global oil and gas industry equates to:

- **U.S.\$12 to \$27 billion** lost revenues
- Over 3.5% of worldwide net dry gas consumption

SIGNIFICANT ENVIRONMENTAL IMPACT

22% of global anthropogenic methane emissions from oil and natural gas operations

Climate change impact of vented gas (**1,600 MtCO₂e**)¹ is almost three times as much as that of the flared gas (**370 MtCO₂e**)²

Emissions can include VOC and HAPs in addition to methane



¹ EPA. *Draft Global Non-CO2 Emissions Projections Report: 1990-2030*. August 2011. Data Annex, Year 2010.

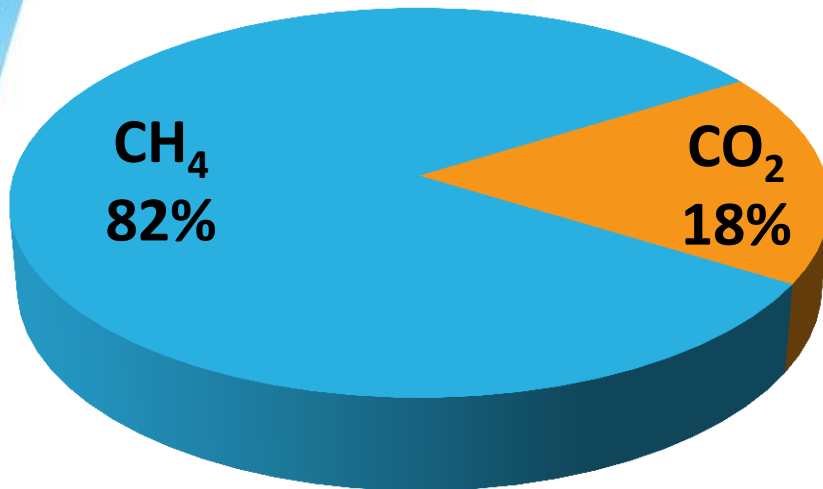
² GGFR. *Estimated Flared Volumes from Satellite Data, 2007-2011*. Year 2010.



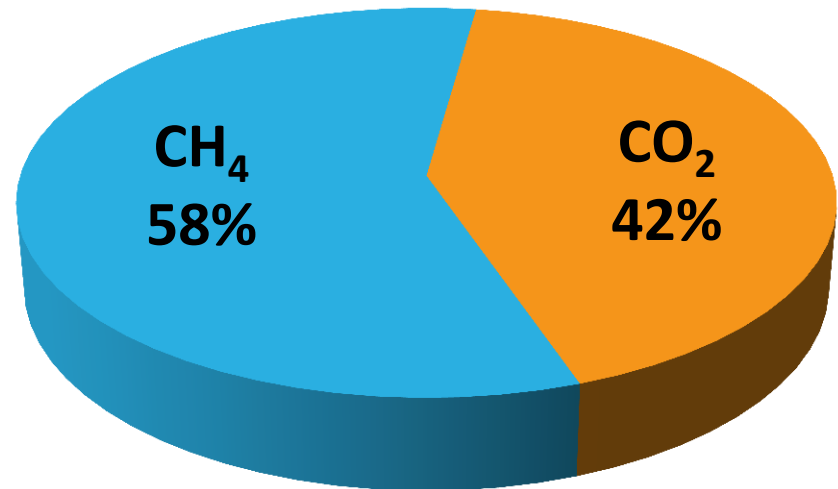
U.S. Natural Gas Industry GHG Emissions

Methane is a short lived climate forcer. On a 20 year global warming potential basis, methane comprises 82% of total U.S. Natural Gas Industry GHG emissions, compared to 58% on a 100 year basis.

20 Year Basis



100 Year Basis



Sources:

- EPA *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010*, April 2012
- 20-year GWP from IPCC



The Global Methane Initiative (GMI)

- The Global Methane Initiative is an international effort to advance cost-effective, near-term methane recovery and use as a clean energy source in five sectors:



Oil & Gas Systems



Coal Mines



Landfills



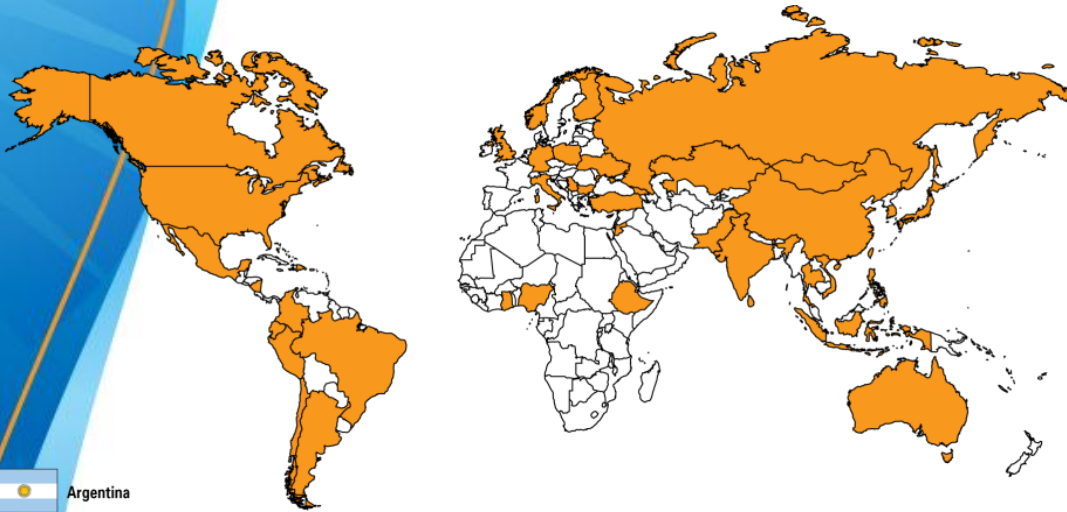
Agricultural Waste



Wastewater

- The goals of the Partnership are to reduce global methane emissions to:
 - Enhance economic growth
 - Strengthen energy security
 - Improve air quality and industrial safety
 - Reduce emissions of greenhouse gases

GMI Global Participation



- Membership:
 - 41 Partner governments
 - 1200+ public and private organizations
- Impact:

Since 2004, GMI has facilitated project development globally at more than **600 sites** and reduced methane emissions by **128 million tCO₂e** (saving **U.S.\$950 Million**) across all GMI sectors

Natural Gas STAR Program

- Started in U.S. in 1993, expanded internationally in 2006
- Over 120 domestic and 15 international partners
 - Identified over 50 cost effective technologies and best practices to reduce methane emissions
 - Reduced methane emissions by nearly 30 Bcm, **saving over \$3 billion**



bp



ExxonMobil



НАЦІОНАЛЬНА АКЦІОНЕРНА КОМПАНІЯ
НАФТОГАЗ
У КРАЇНІ



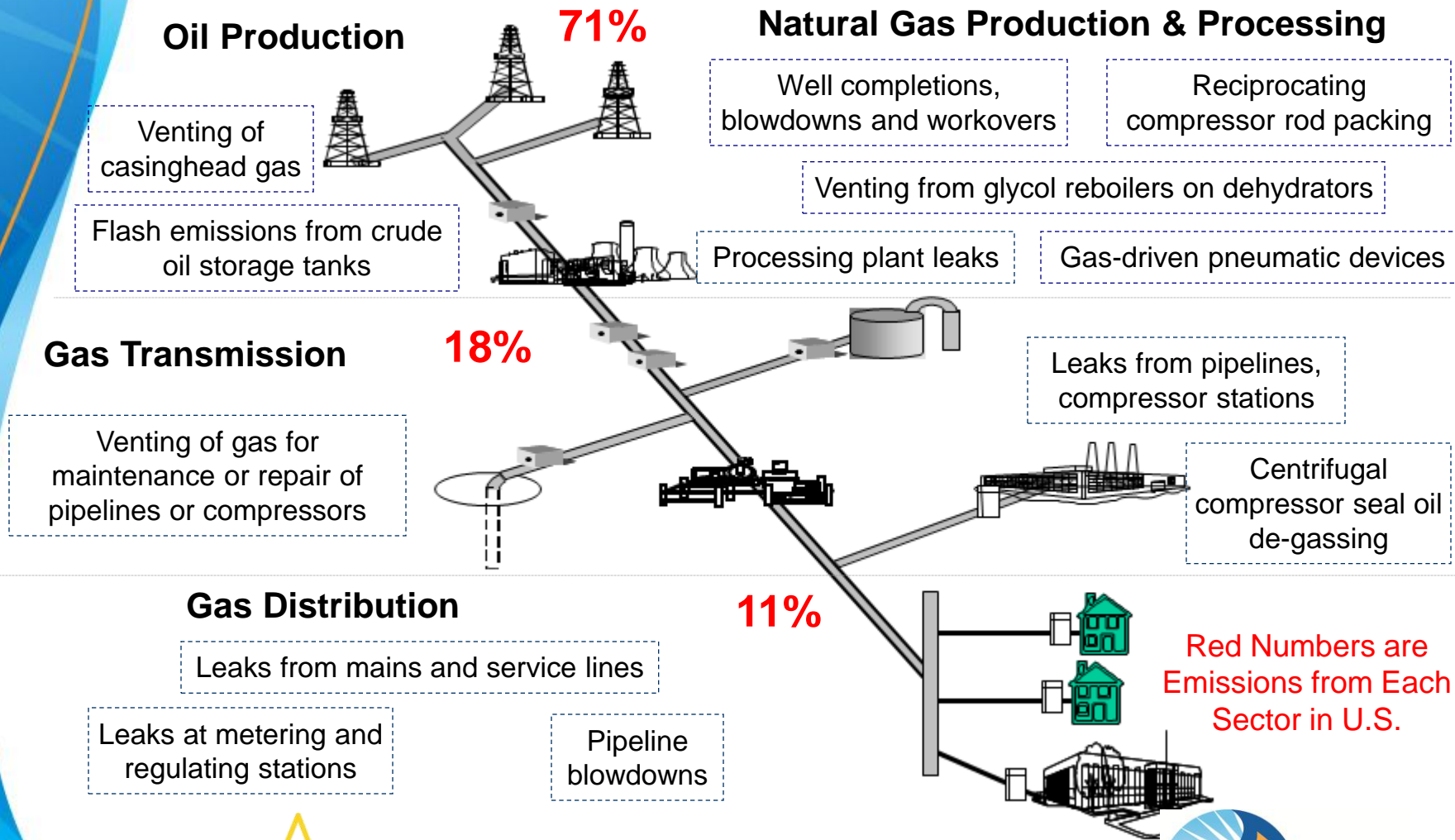
NATIONAL JOINT-STOCK COMPANY
NAFTOGAZ
OF UKRAINE



ConocoPhillips



Sources of Methane Emissions from Oil and Gas Operations



Picture courtesy of American Gas Association

Values Source: 2012 Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010

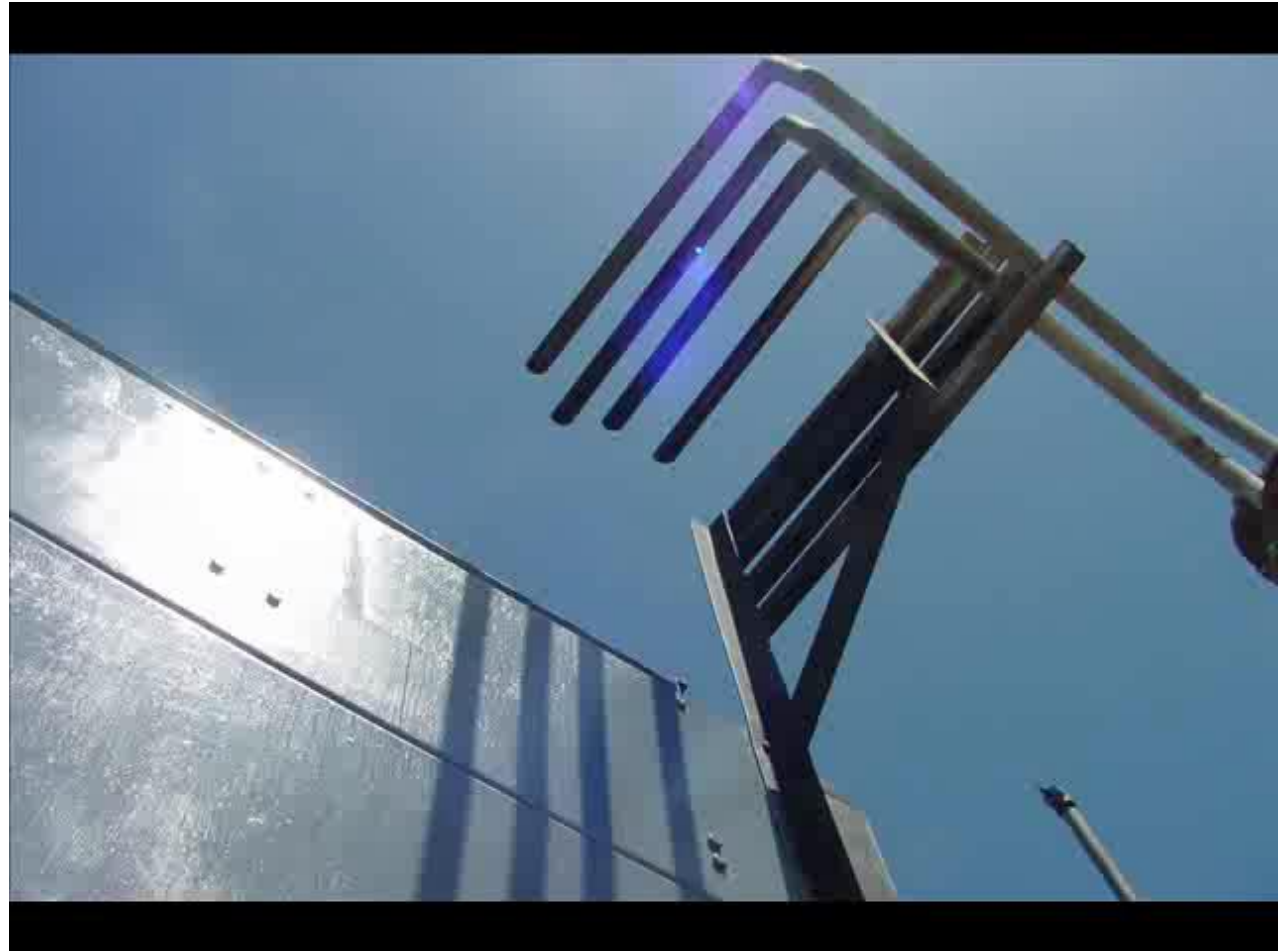


Companies May Not Realize the Volume of Gas They Are Losing



Emissions may be not readily visible or identifiable without specialized equipment, yet they represent significant natural gas losses, reduced operational efficiency, greenhouse gas emissions, and potential safety risks.

Wet Seal Centrifugal Compressor Vent



Condensate Storage Tank Vent



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 help companies identify and assess project opportunities
 - Estimated methane emission inventories
 - Measurement studies
 - Mitigation project feasibility studies



All technical documents are available in Arabic



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)					
Convert Natural Gas-Driven Chemical Pumps PRO Fact Sheet #202 (PDF) (3 pp, 130K)					
Replacing Gas-Assisted Glycol Pumps with Electric Pumps Lessons Learned (PDF) (17 pp., 197K)					

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Tanks

Document Title
Convert Water Tank Blanket from Natural Gas to Reduced CO ₂ Gas

Screenshot from EPA Gas STAR website

- 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

U.S. GHG Reporting Program

- Direct emitters of GHGs with emissions equal to or greater than 25,000 metric tons CO₂ eq./year
- Covers roughly 90% of total U.S. emissions
- **Petroleum & Natural Gas Systems** (Subpart W)
 - 25 Source categories
 - Estimated to cover 2,800 U.S. facilities
 - Onshore petroleum and natural gas production
 - Offshore petroleum and natural gas production
 - Natural gas processing
 - Natural gas transmission compressor stations
 - Underground natural gas storage
 - Liquefied natural gas (LNG) storage
 - LNG import and export terminals, and
 - Natural gas distribution
 - Begin reporting for 2011
- “Can not manage what you do not measure”

<http://www.epa.gov/climatechange/emissions/subpart/w.html>



U.S. Mandatory Air Pollution Control

- EPA finalized **New Source Performance Standards (NSPS)** and **National Emission Standards for Hazardous Air Pollutants (NESHAP)** for the oil and natural gas industry on April 17, 2012
- Includes the first federal air standards for hydraulically fractured wells
- Standards would:
 - Reduce emissions of smog-forming volatile organic compounds (VOCs), and air toxics including the carcinogen benzene.
 - Significant environmental co-benefit by reducing methane emissions from new and modified wells
- Updated standards based on existing, cost-effective technology
 - Will institutionalize best practices already in place in some states and in use by several companies
- Technologies will allow US operators to save between U.S.\$11 and \$19 million per year even as they cut emissions of benzene and other air toxics, as well as volatile organic compounds – pollutants that form ground-level ozone (smog), which can cause asthma and adversely affect emphysema

<http://www.epa.gov/airquality/oilandgas>



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 – a 20% reduction in global methane emissions could avoid large Northern Hemisphere mortality (140,000 – 400,000 lives in 2030)³
 - Reduction of local emissions of VOCs and HAPs from landfills, agriculture, and oil and gas systems
 - Odor reductions in the landfill and agriculture sectors
- **Water Quality Benefits**
 - Local water quality improvements due to improved management of agricultural wastes and leachate from landfills
- **Industrial Safety**
 - Methane is explosive - improved worker safety in the coal mining and oil & gas sectors



³ According to research by West and Fiore, 2005



Contact and Further Information

Roger Fernandez

Team Leader, U.S. EPA
Global Methane Initiative – Oil & Gas
Natural Gas STAR International
+1 (202) 343-9386
fernandez.roger@epa.gov

Global Methane Initiative

globalmethane.org

Recommended Technologies (Arabic)

epa.gov/gasstar/tools/arabic/index.html

