Advancing Climate Protection, Operational Safety and Energy Security via Methane Emissions Management

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وزارة البترول والثروة المعدنية
المملكة العربية السعودية

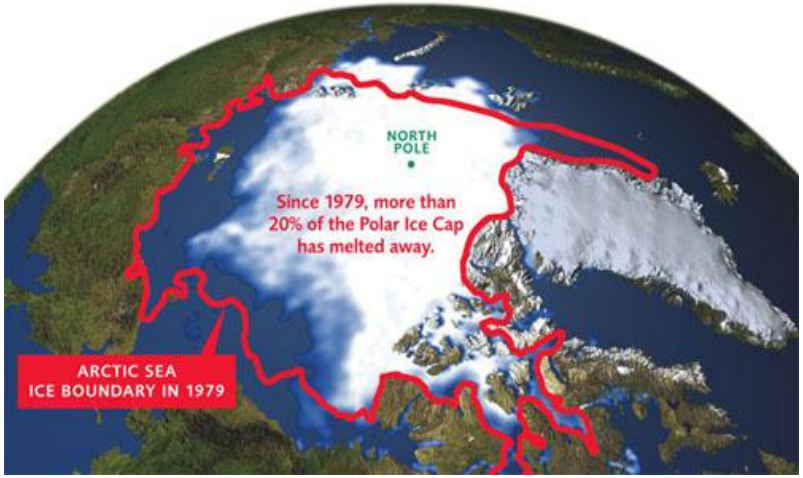
CLIMATE AND CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

ارامكو السعودية
Saudi Aramco

Global Methane Initiative

Scientific Evidence Compels Immediate Action*

- "the science now shows with 95 percent certainty that human activity is the dominant cause of observed warming since the mid-20th century . . . warming in the climate system is unequivocal, with many of the observed changes unprecedented over decades to millennia: warming of the atmosphere and the ocean, diminishing snow and ice, rising sea levels and increasing concentrations of greenhouse gases."



*IPCC AR5 Climate Change 2013: The Physical Science Basis

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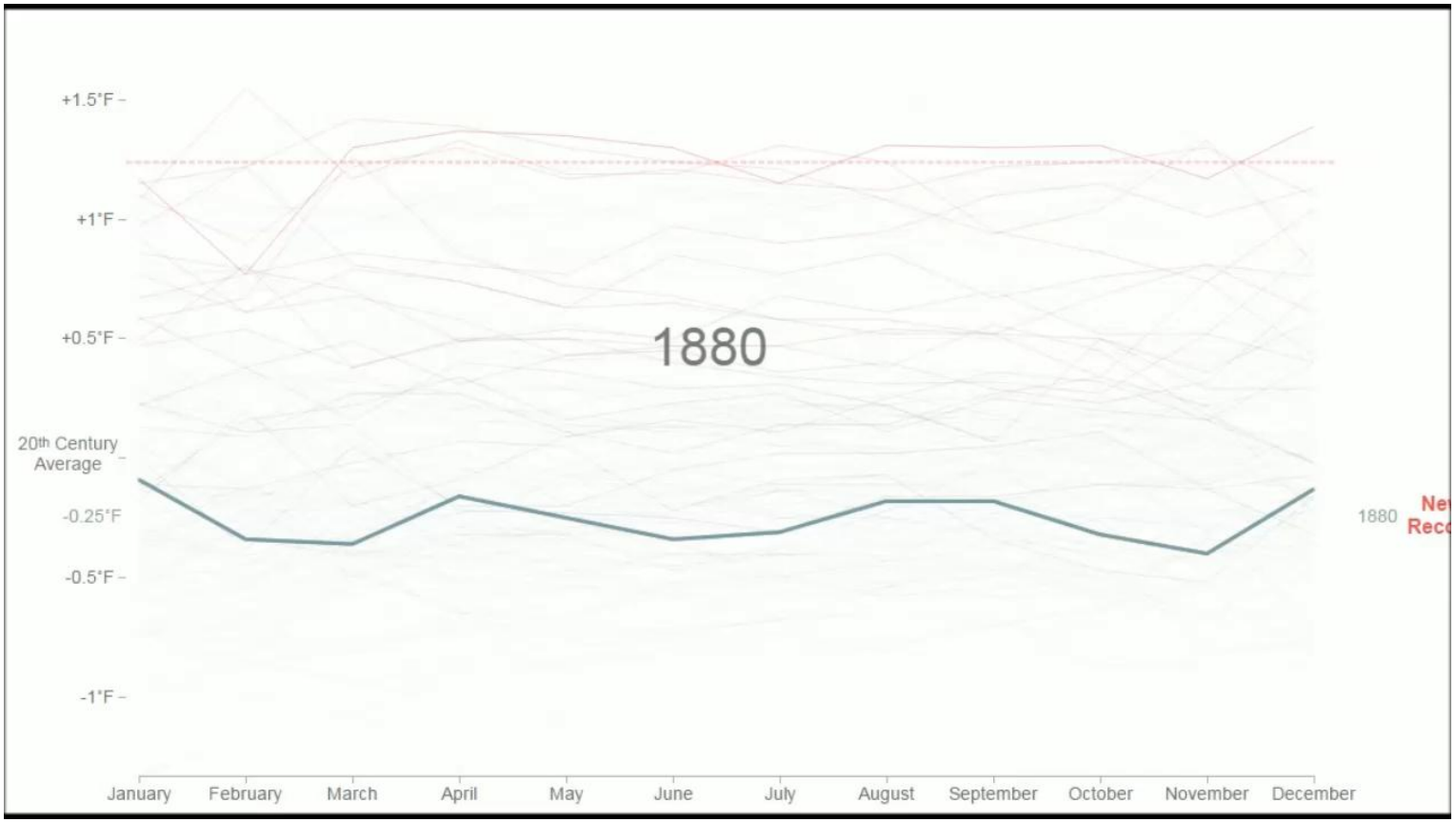
Global Average Temperature Rise Over the Last Century



Source - http://www.bloomberg.com/graphics/2014-hottest-year-on-record/

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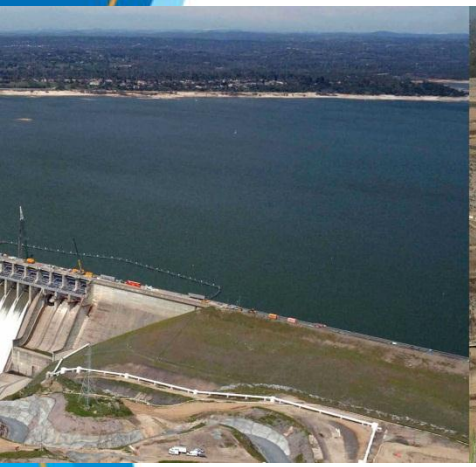
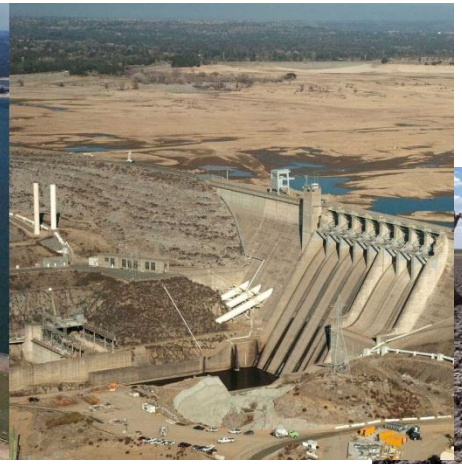
GHG Emissions Disrupting the Climate

- Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.





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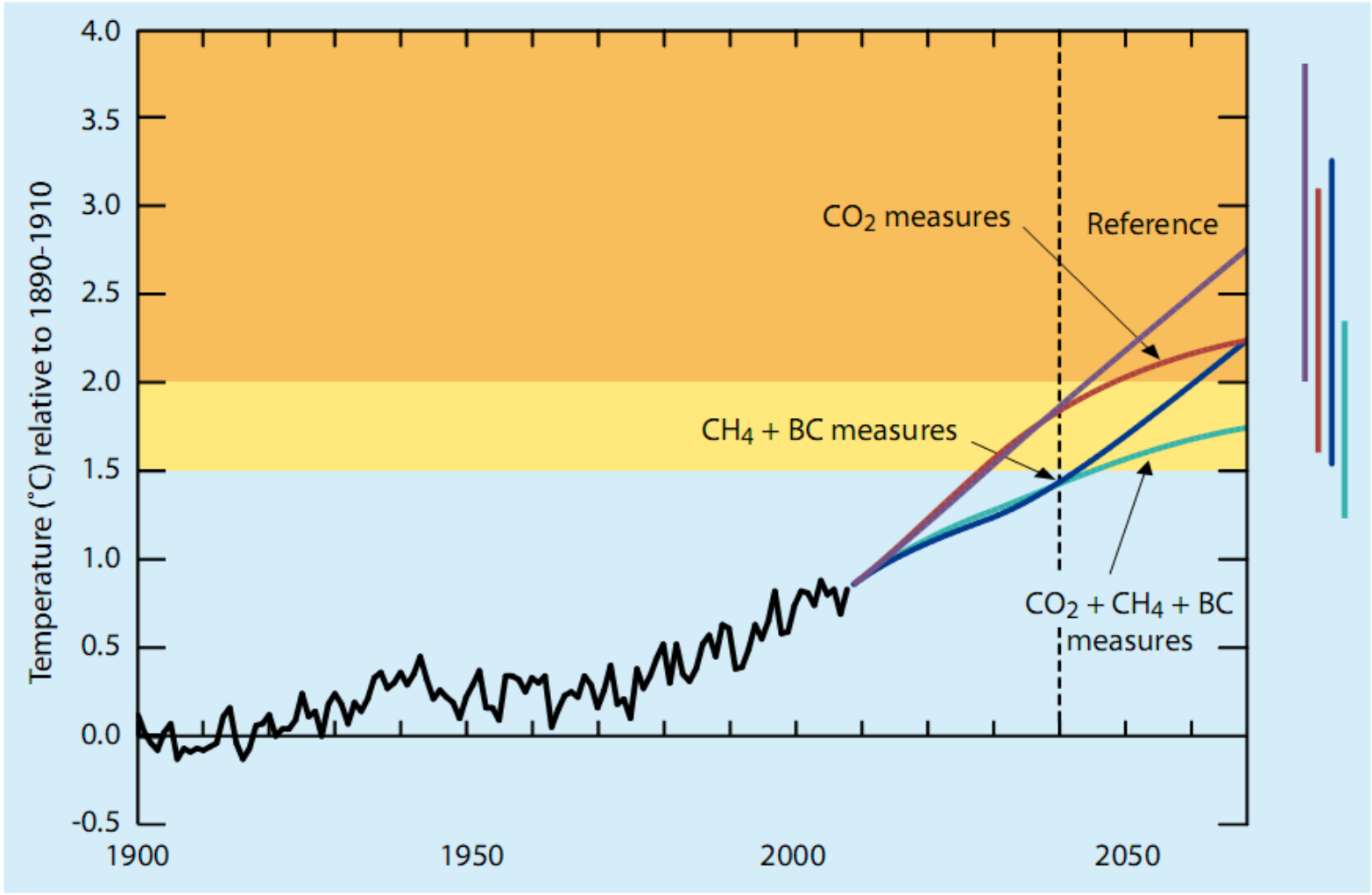

Figure 3. Observed deviation of temperature to 2009 and projections under various scenarios. Immediate implementation of the identified BC and CH_4 measures, together with measures to reduce CO_2 emissions, would greatly improve the chances of keeping Earth's temperature increase to less than 2˚C relative to pre-industrial levels. The bulk of the benefits of CH_4 and BC measure are realized by 2040 (dashed line).

Source: UNEP & WMO, 2011.

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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 background ground-level ozone – a 20% reduction in global methane emissions could avoid large Northern Hemisphere mortality (140,000 – 400,000 lives in 2030)
  - 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 in landfills
- Industrial Safety
  - Methane is explosive - improved worker safety in the coal mining and oil & gas sectors

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Global Methane Initiative (GMI)

- **Mission:**

  GMI is a voluntary, multilateral partnership that aims to reduce methane emissions and to advance the abatement, recovery and use as a clean energy source
  - Began in 2004 (as Methane to Markets)
  - Targets Five Sector-Specific Areas for Methane Reduction
    - Agriculture, Coal Mines, Landfills, Municipal Wastewater, and Oil & Gas Systems
  - Complements UNFCCC
- **Impact:**

  Participants cover nearly **70% of total global methane emissions**
  - Since 2004, GMI has helped facilitate projects that have now **reduced 151 MMTCO2e of methane**

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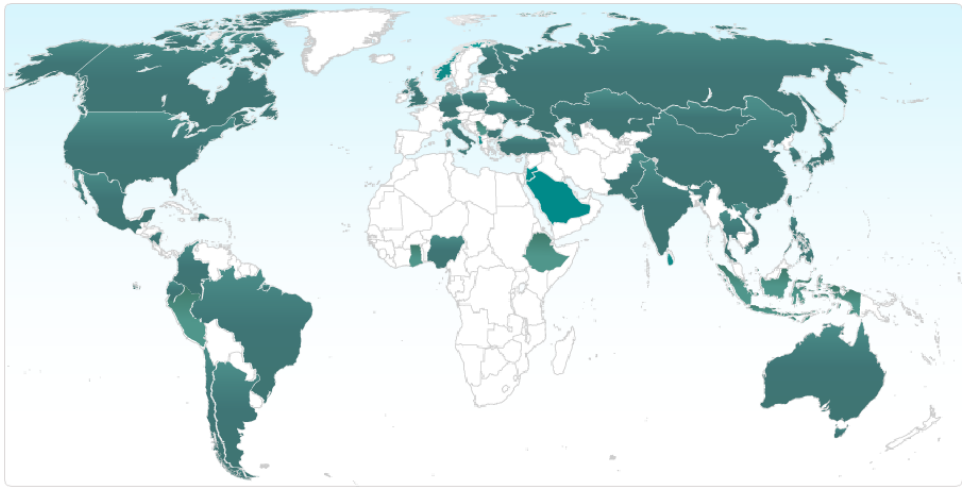
GMI Global Participation



Membership:

GMI is a partnership of Country Partners and the Project Network committed to cost-effect methane emission reduction opportunities.

- Partner Countries
  - 42 Partner Countries and the European Commission
  - Saudi Arabia joined GMI in 2014

Albania
Argentina
Australia
Brazil
Bulgaria
Canada
Chile
China
Columbia
Dominican Republic
Ecuador
Ethiopia
European Commission
Finland
Georgia
Germany
Ghana
India
Indonesia
Italy
Japan
Jordan
Kazakhstan
Mexico
Mongolia
Nicaragua
Nigeria
Norway
Vietnam
Pakistan
Peru
Philippines
Poland
Republic of Korea
Serbia
Russia
Saudi Arabia
Sri Lanka
Thailand
Turkey
Ukraine
United Kingdom
United States

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Farms and Landfills—Providing Renewable Energy

Animal Waste
to Cooking Fuel
in Vietnam

Landfill Gas to
an Infrared Heater
in Ukraine

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Oil, Natural Gas and Coal Mining—Environment and Energy Solutions

Reducing Leaks and Losses from Natural Gas and Oil Operations—More Energy to Markets and less VOCs and HAPs

Capturing Methane from Gassy Mines—Clean Energy and Mine Safety

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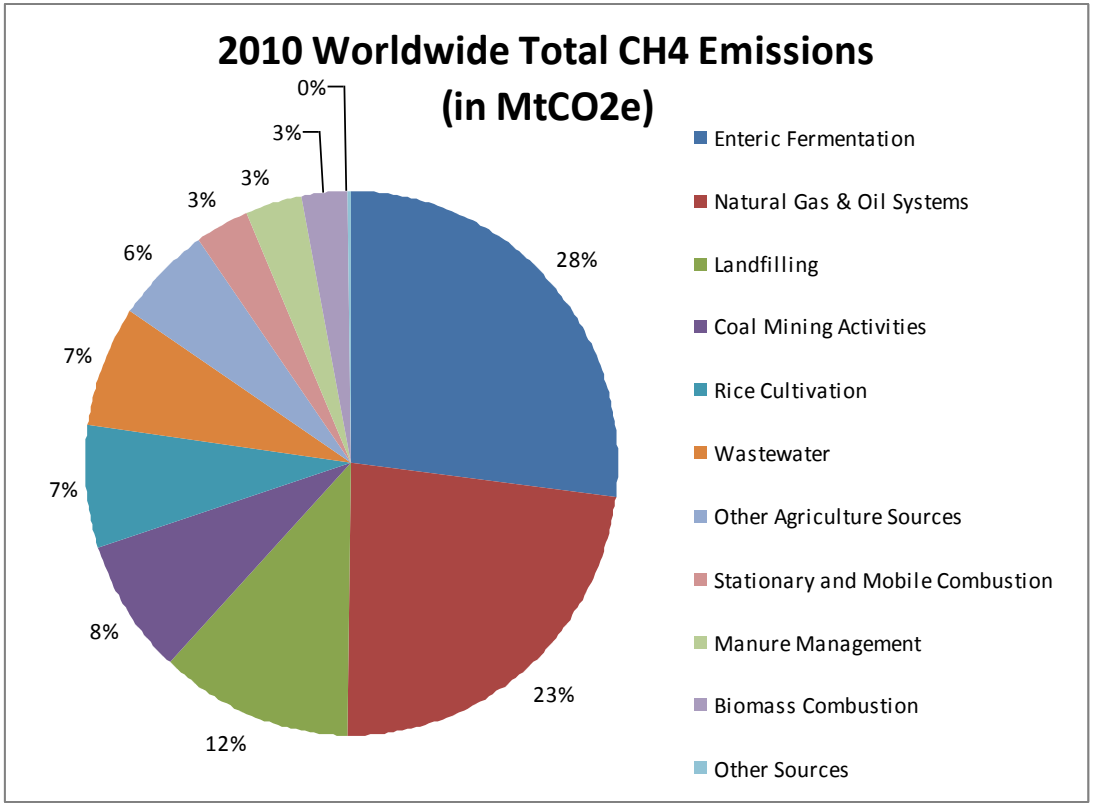
Oil and Gas Sector Provides Important Mitigation Opportunity

- 84 times more potent than CO_2 over 20-years
- IEA: upstream methane emissions one of 4 key energy sector GHG reduction opportunities



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Sources of Methane Emissions from Oil and Gas Operations

Oil Production

Venting of casinghead gas

Flash emissions from crude oil storage tanks

Natural Gas Production & Processing

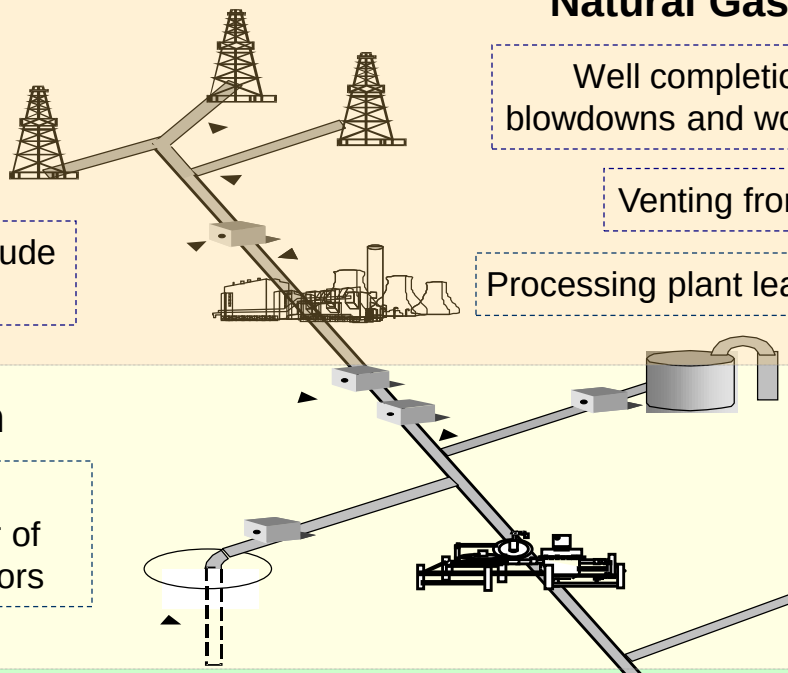
Well completions, blowdowns and workovers

Reciprocating compressor rod packing

Venting from glycol reboilers on dehydrators

Processing plant leaks

Gas-driven pneumatic devices



Gas Transmission

Venting of gas for maintenance or repair of pipelines or compressors

Leaks from pipelines, compressor stations

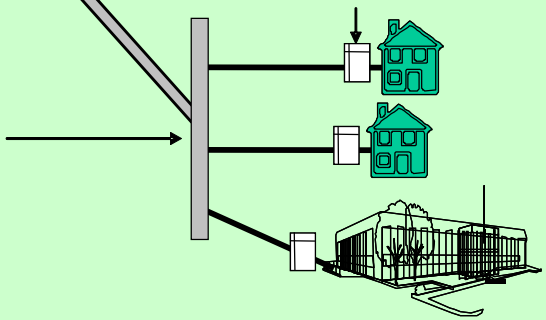
Centrifugal compressor seal oil de-gassing

Gas Distribution

Leaks from unprotected steel mains and service lines

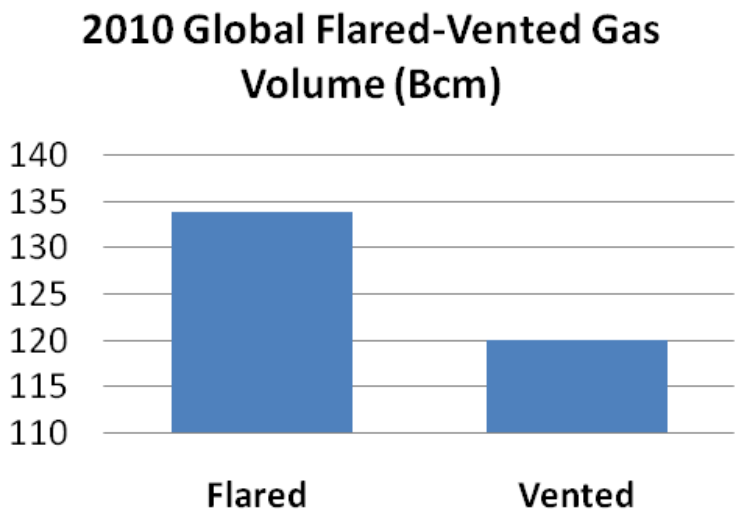
Leaks at metering and regulating stations

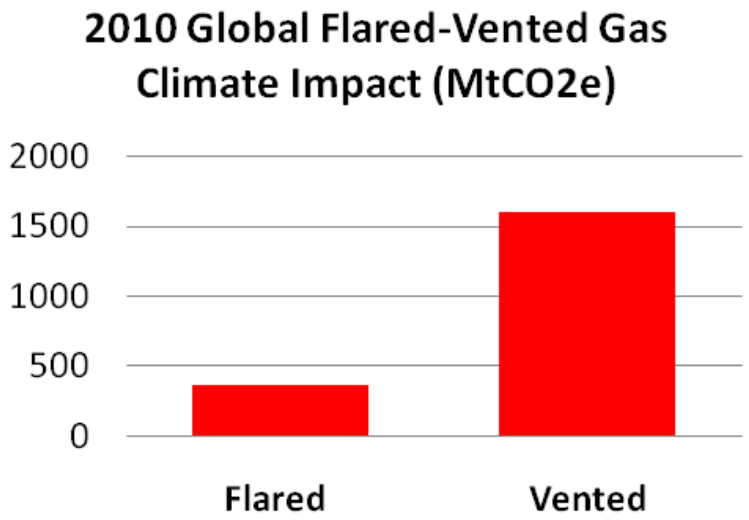
Pipeline blowdowns



Picture courtesy of American Gas Association

Vented vs. Flared Gas – Climate Impacts





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Awareness is Critical

- Economic, Safety, and Environmental Challenges
- Over **110 billion m^3 of natural gas** lost annually by global oil & gas industry equates to:
  - U.S. **$12 to $27** billion lost revenues
  - Over **3.5%** of worldwide net dry gas consumption
- **23%** of global anthropogenic methane emissions from oil & natural gas operations
- Emissions can also include VOC and HAPs

Source - http://www.epa.gov/gasstar/tools/videos.html

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Methane Emissions May Go Unnoticed - Tank Venting

Source - http://www.epa.gov/gasstar/tools/videos.html

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GMI Oil and Gas Sector Partners

WE FUEL AMAZING

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Celebrating 2 Years
OF GLOBAL ACTION AGAINST SLCPs

- Voluntary international effort bringing together countries, companies, and others to work together to substantially and cost-effectively reduce methane, black carbon, and HFCs
  - Action-oriented, ambitious, and high political interest
  - 10 initiatives; Science Advisory Panel; UNEP Secretariat
- CCAC Oil and Gas Methane Partnership
  - Establish systematic approach to reducing methane emissions from 9 core sources
  - 7 Charter Partner Companies - launched at UN Climate Summit, September 2014

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Building Capabilities, Confidence and Trust

- Enormous economic opportunity to reduce methane losses from oil & gas operations
  - **Increases energy security**
  - **Improves air quality and industrial safety**
  - **Contributes to climate protection**
- Success not only possible but also good business!
  - **US$12 to $20 Billion** in potential new revenue
- Delayed action increases costs to society
- Efficient information sharing reduces mitigation costs
- Collaboration expands technical knowledge, builds confidence and fosters trust necessary for effective global climate change response

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www.globalmethane.org

http://www.epa.gov/gasstar/international/index.html

http://www.epa.gov/gasstar/tools/recommended.html

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