



# Methane to Markets

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## **Methane to Markets Overview: Oil & Gas Sector**

**International Workshop on Methane Emissions Reduction  
Technologies in the Oil and Gas Industry  
Lake Louise**

**14-16 September, 2009**

# Background: Methane to Markets

- The **Methane to Markets Partnership (M2M)** is an international initiative that advances cost-effective, near-term methane recovery and use as a clean energy source in four sectors:



*Oil and Gas Systems*



*Coal Mines*



*Landfills*



*Agricultural Waste*

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

# Methane to Markets – Oil & Gas Subcommittee

The Partnership brings together interested parties from governments and the private sector to facilitate methane project development and implementation around the world.

- Mexico, Russia, and Canada co-chair
- U.S. delegate provides administrative support



# Methane to Markets Partnership

- 30 Partner Governments

## North America

Canada  
Mexico  
United States

## South America

Argentina  
Brazil  
Chile  
Colombia  
Ecuador

## Africa

Nigeria

## Europe & FSU

Bulgaria  
European Commission  
Finland  
Georgia  
Germany  
Italy  
Kazakhstan  
Poland  
Russia  
Ukraine  
United Kingdom

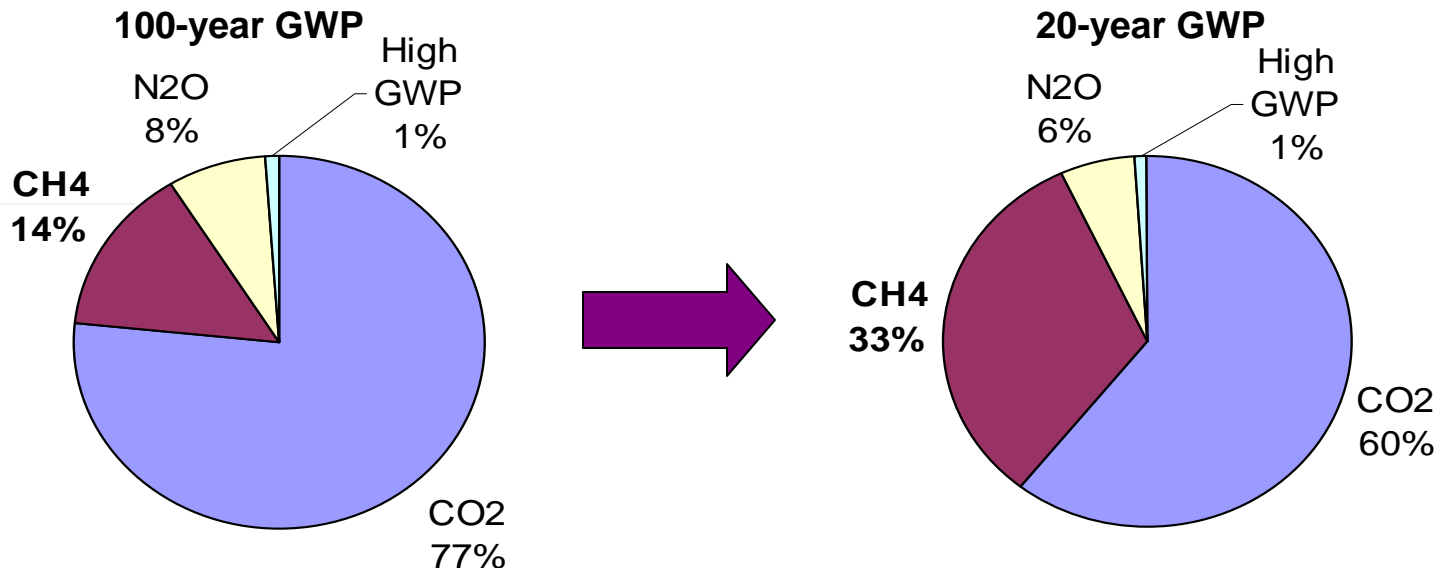
## Asia Pacific

Australia  
China  
India  
Japan  
Korea  
Mongolia  
Pakistan  
Philippines  
Thailand  
Vietnam

- Private companies, multilateral development banks and other relevant organizations participate by joining the ***Project Network – over 900 organizations now participating***

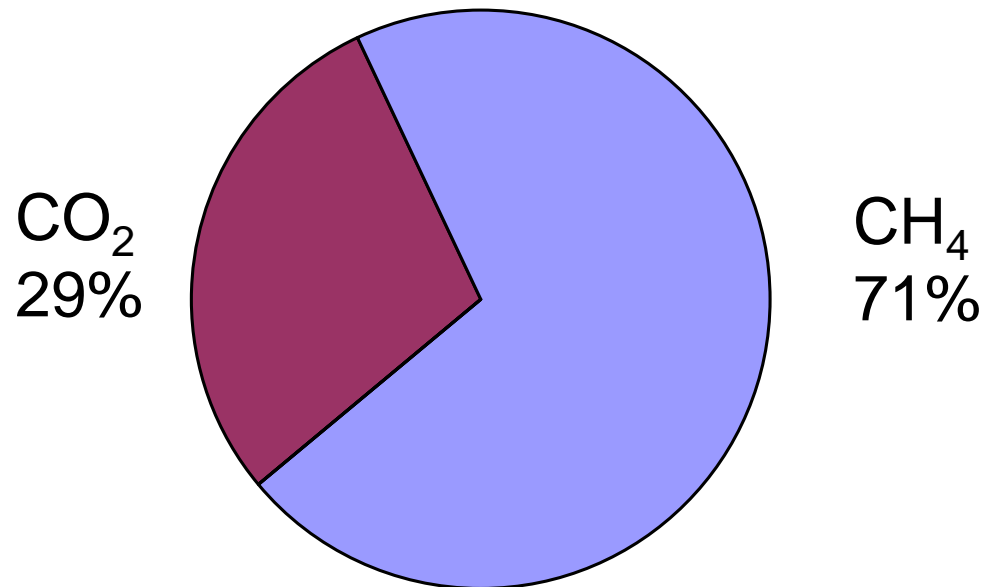
# Why focus on Methane?

- A potent greenhouse gas (GHG) with 100-year global warming potential (GWP) of 25; 20-year GWP of 72
  - Significant affect on short term climate change
- Oil and natural gas operations are a significant source of total global man-made methane emissions.
  - EPA estimates that methane emissions are projected to grow globally by more than 33% from 2005 to 2015.



## U.S. Natural Gas Industry GHG Emissions: 20-year GWP Basis

- Methane emissions comprise 72% of total U.S. Natural Gas industry GHG emissions



N<sub>2</sub>O Emissions are negligible

EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2007*. April, 2009.

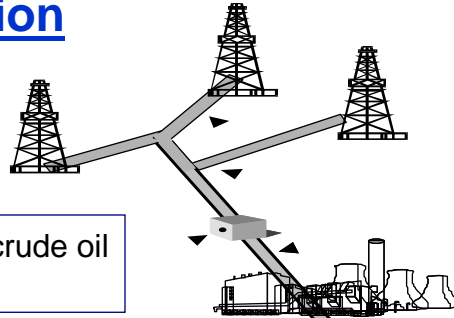
Updated with 20-year GWP from IPCC. *Changes in Atmospheric Constituents and in Radiative Forcing*. 2007. 5

# 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

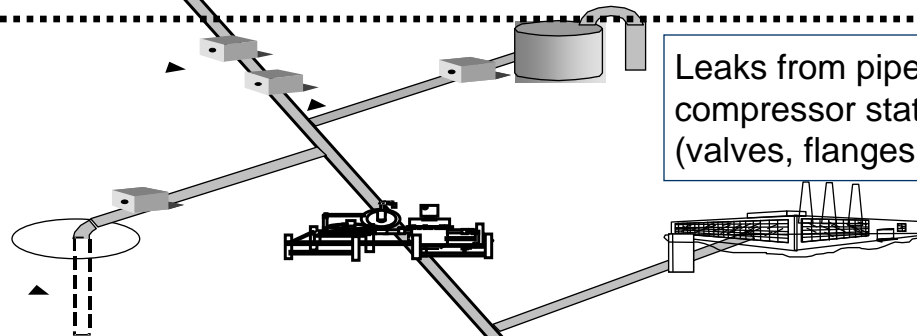
Venting from glycol reboilers on dehydrators

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 (valves, flanges, etc.)

Compressor blowdown venting

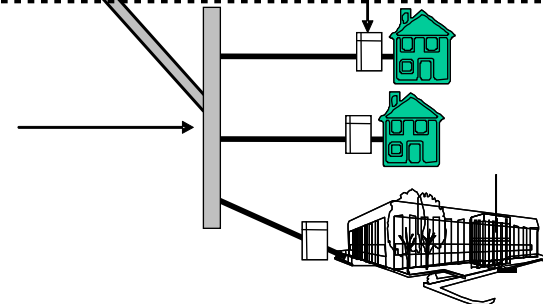
Centrifugal compressor seal oil de-gassing

## Gas Distribution

Leaks from unprotected steel mains and service lines

Leaks at metering and regulating stations

Pipeline blowdowns



# Cost-Effective Methane Mitigation Opportunities

## Oil Production

Route casinghead gas to VRU or compressor for Recovery & Use or Sale

Install VRUs on crude oil storage tanks

Reduced emission well completions

Economic replacement of reciprocating compressor rod packing

Install flash tank separators on dehydrators

Identify, measure & fix leaks in processing plants

## Gas Transmission

Use pipeline pumpdown

Composite Wrap for Non-Leaking Pipeline Defects

Identify, measure & fix leaks in compressor stations & pipelines

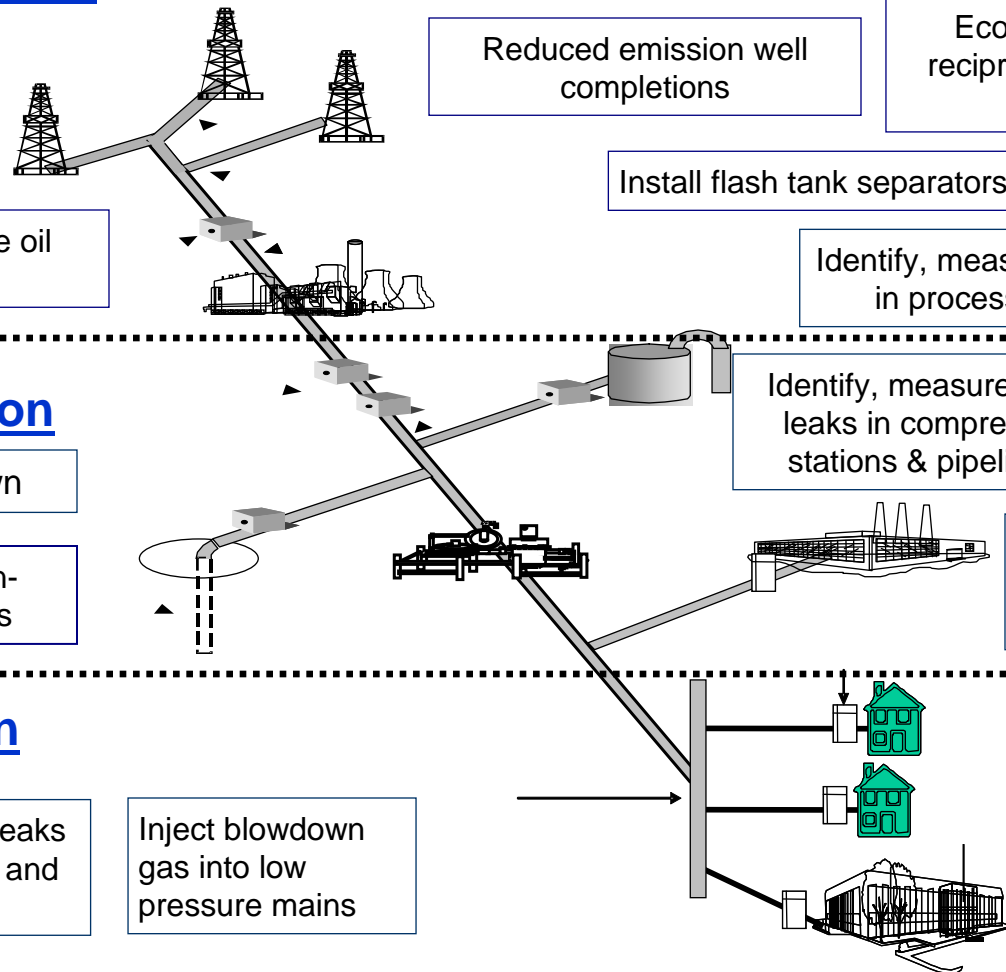
Re-route gas to fuel system or sales line or flare

Replace wet seals with dry in centrifugal compressors

## Gas Distribution

Identify, measure & fix leaks in pipelines & metering and regulating stations

Inject blowdown gas into low pressure mains





# Evaluating Methane Emission Sources and Opportunities

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Approaches to identifying methane emission sources and reduction opportunities:

- Top Down: Some companies develop emissions inventories at the company level using emissions and activity factors
  - Benefits: Can help identify general project areas and inform mitigation programs at the company level
  - Limitations: Too general for project-based investment; uncertainty in factors and system diversity can lead to poor data
  
- Bottom Up: Project based equipment level analysis (desktop pre-feasibility assessments and onsite measurement studies)
  - Benefits: Produces high quality, process-specific information
  - Limitations: Covers discreet parts of the system; onsite measurement studies can be more expensive

# Key Factors in Analyzing Project Opportunities

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## Key factors in evaluating project economics:

- **Gas Value:** Oil and gas companies value their gas and emission reduction differently
  - Is there a sales outlet for recovered gas?
  - Are there investor or government requirements on gas valuation?
  - Will recovered gas be used to displace onsite fuel usage?
  - Will recovered gas in one part of the system cause increased venting or flaring in another place?
  
- **Implementation and O&M Costs:** Vary greatly based on country labor rates and sources of equipment
  
- **Additional Project Benefits:** Longer equipment life, decreased maintenance, increased energy efficiency, increased production, etc.

# Key Factors in Analyzing Project Opportunities, cont.

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Other important considerations in evaluating project economics and implementation:

- Source and Structure of Project Financing:
  - Internal, loans, carbon finance, etc.
- Overall System Investment and Replacement Plans:
  - Efficiencies can be achieved when projects are factored into system-wide maintenance and engineering plans
- Potential for Carbon Credits:
  - Can add value to projects but also take time and effort to organize
- Scalability:
  - Do implementation of opportunities across multiple facilities make it economical? e.g. IR Camera

# Beyond Project Economics

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- Companies have reported many reasons for reducing methane emissions:
  - Safety concerns
  - Utilization of local energy source
  - Operational and efficiency improvements such as reduced maintenance and fuel costs
  - Reduced loss of a valuable domestic non-renewable fuel
  - Corporate mandate to operate in environmentally responsible manner
  - Internal greenhouse gas emission reduction goals
  - Addressing shareholder concerns about mitigating future climate risk
  - Local air quality improvement

# A Note on Project Economics

- At \$3/Mcf, 77% of the 80 recommended technologies and practices pay back within 3 years and 47% pay back within 1 year
- Economics based on gas value alone may not always drive projects
- Gas value can be augmented if
  - Gas used to replace more expensive fuel (eg. for electricity generation)
  - Natural gas liquids value included
  - Carbon credit is leveraged
- Four Clean Development Mechanism (CDM) methodologies approved or under review





# How EPA through Methane to Markets Can Partner with Interested Companies

## Develop Estimated Emissions Inventory

- Companies provide operational data
- EPA estimates methane emissions & proposes emission reduction opportunities
- EPA delivers report to company detailing economic and operational benefits, emission reductions and environmental benefits
- Helps prioritize opportunities

## Conduct “Desktop” Project Analysis

- Using results from estimated inventory, EPA and company can agree to priority projects with high economic and environmental potential
- EPA will do deeper analysis to provide more specific project recommendation (detailed technical, economic, etc. information)

## Conduct Measurement Study

- For companies seriously considering implementing emission reduction project, EPA can conduct in country measurement studies for proposed projects
- EPA sends team with methane emission identification and measurement equipment to quantify actual methane emissions

## Contact Information

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