



Methane to Markets Partnership

Overview of Oil and Gas Sector Methane Emissions and Potential Projects

**Methane to Markets Ministerial Meeting
Washington, DC**

November 15, 2004



Overview

- ★ Background on World-Wide Methane Emissions
- ★ Methane to Markets Partnership
- ★ Natural Gas Sector Emissions Reduction Opportunities



Methane Characteristics

- ★ A potent greenhouse gas
 - 100-year GWP = 23
 - Short atmospheric lifetime (~12 years)
- ★ Emitted by many sources in energy, agriculture & waste sectors
- ★ Primary constituent of natural gas
 - Serves as a valuable, clean-burning energy source

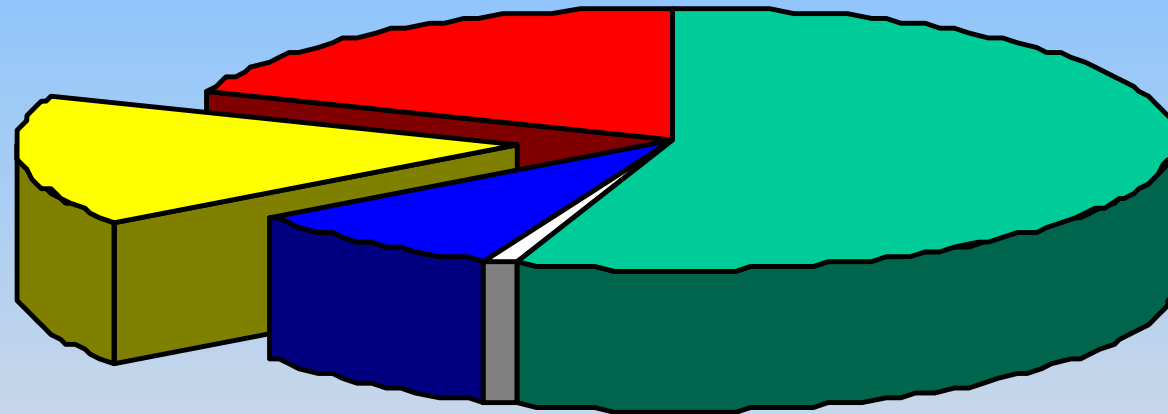


Global Greenhouse Gas Emissions in 2000

Total = 40,702 Million tons CO₂ equivalents (MtCO₂e)

Carbon Dioxide
(Land Use Change and Forestry) - 19%

Methane - 16%



Nitrous Oxide - 9%

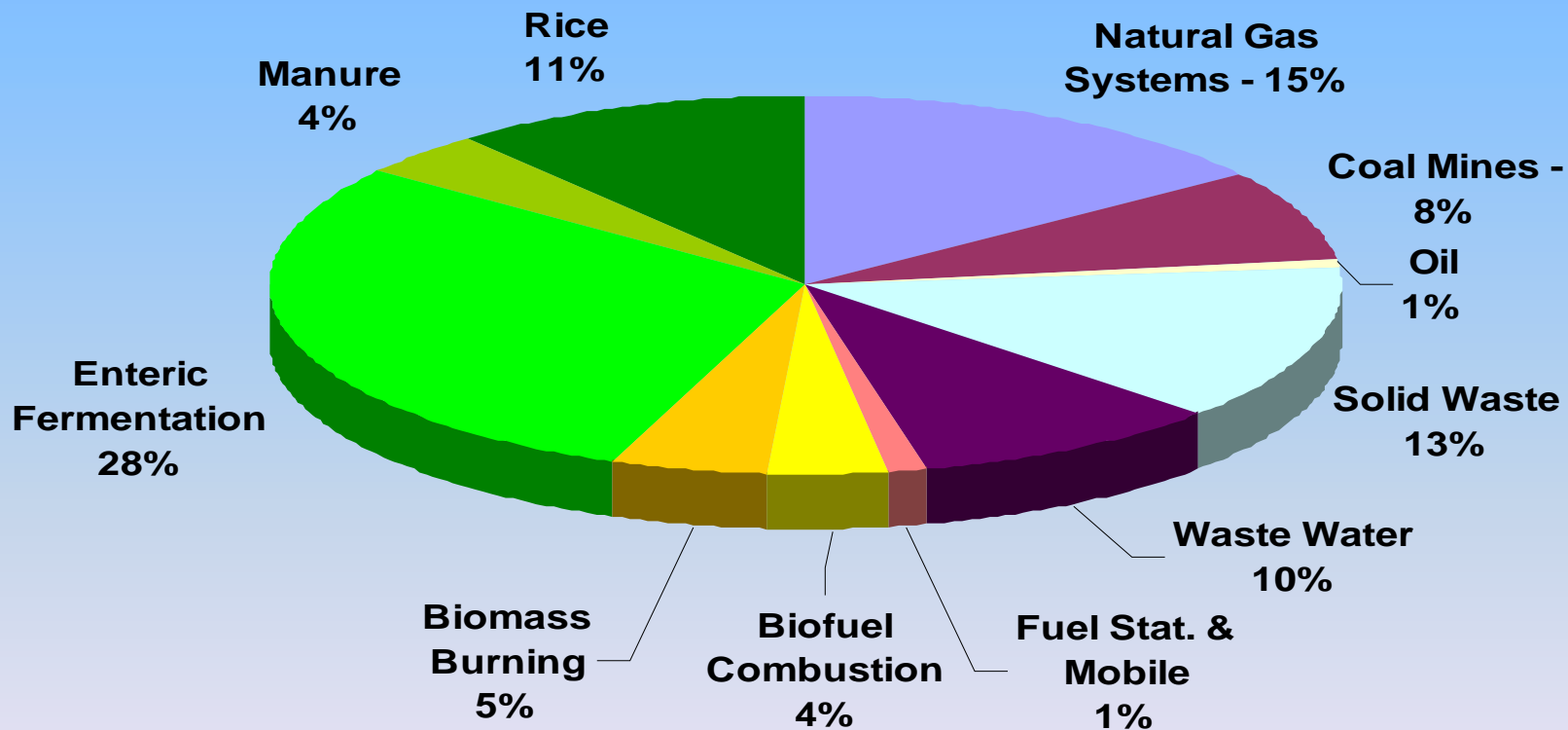
CFCs, HFCs,
PFCs, SF6 - 1%

Carbon Dioxide
(Fuel and Cement) - 55%



Global Anthropogenic CH₄ Budget by Source in 2000

Total emissions in 2000 = 5,933 MtCO₂e



Source: US EPA



Methane to Markets Partnership



Methane to Markets Partnership Mission

- ★ **Deliver measurable, near-term climate protection through cost-effective actions such as oil and gas system methane emissions reduction projects**
- ★ **Support international and sustainable development goals (i.e., clean energy, ghg reductions)**
- ★ **Conduct technology transfer and build capacity in developing and countries with economies in transition with clear focus on methane emissions reduction activities**
- ★ **Leverage existing international expertise and activities**
- ★ **Directly involve private sector**



Methane to Markets Activities

★ Identify cost-effective opportunities for capturing methane emissions

- Source and project identification
- Feasibility studies

★ Technology Transfer

- Workshops and conferences
- Technology demonstration
- Clearinghouses



Methane to Markets Activities

- ★ **Inventory systems support to identify and monitor methane emissions**
- ★ **Private and multilateral project financing assistance**



Methane to Markets & Oil and Natural Gas Sector Methane Emissions Reduction Projects



Methane Emissions Sources

★ Gas producing operations

- New gas well drilling
- Mature gas well venting for liquids unloading
- Pneumatic devices
- Glycol dehydrator venting
- Compressor seals

★ Oil producing operations

- Associated gas venting
- Oil tank venting



Methane Emissions Sources

★ Gas processing operations

- Gas gathering pneumatic devices
- Gas gathering glycol dehydrator vents
- Processing plant fugitive emissions
- Compressor seals
- Compressor blowdown

★ Transmission operations

- Compressor blowdown
- Compressor station fugitive emissions
- Compressor seals
- Pipeline venting for repairs and new connections



Methane Emissions Sources

- ★ Distribution gate stations and surface facilities
 - Gate station fugitive emissions

- ★ Distribution system underground main and service pipelines
 - Older distribution system cast iron pipe
 - Newer distribution system unprotected steel pipe



Cost-Effective Methane Emission Reduction Technologies and Practices

<u>Abatement Option</u>	<u>Description</u>	<u>Reduction Efficiency</u>	<u>Applicable Sub-Sector</u>
Install Flare Systems	Flaring devices burn vented gas, thus converting methane to carbon dioxide. Applicable to onshore and offshore gas wells.	95%	Natural Gas (NG) Production
Green Completions	After drilling new wells, instead of venting the well to remove debris additional separator traps and dehydrators are used to route gas to sales.	70%	NG Production
Replace High Bleed Pneumatics with Low Bleed Systems	Replace NG powered pneumatic devices that are designed to emit (bleed) large quantities of NG with low bleed pneumatics.	86%	NG Production, Processing and Transmission
Install Vapor Recovery Units	During crude oil storage, light hydrocarbons vaporize out of solution and vent to the atmosphere. Vapor recovery units capture these vapors for fuel or sales.	95%	Crude Oil Storage Tanks



More Methane Emission Mitigation Options

<u>Abatement Option</u>	<u>Description</u>	<u>Reduction Efficiency</u>	<u>Applicable Sub-Sector</u>
Directed Inspection & Maintenance at Compressor Stations	Conduct leak detection surveys of facilities to identify and repair leak sources that are cost effective.	13%	NG Processing and Transmission
Fuel Gas Retrofit for Blowdown Valves	Installing a connection to fuel gas, the methane that is typically vented during a compressor blowdown is recovered to supplement fuel.	33%	NG Transmission
Composite Wrap Repairs	Composite wrap repairs can be implemented with the pipeline in service, preventing the need to shutdown and vent gas from the pipeline.	100%	NG Transmission



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★ Benefits of Oil and Gas Sector Methane Emissions Reduction Projects

- Increased revenue through gas sales and/or greenhouse gas emissions credits
- Greenhouse gas emissions reductions
- Increased energy independence
- Decreased O&M costs



Selected Methane to Markets Partner Country Oil and Gas Sector Methane Emissions

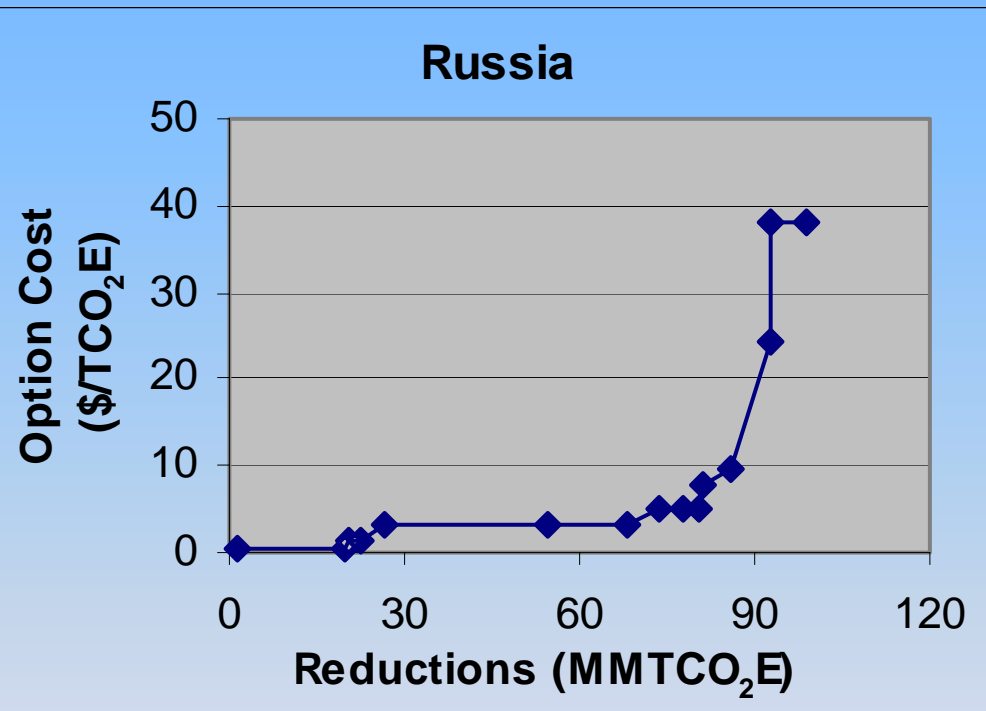


Country-Reported Methane Emissions from Natural Gas Infrastructure

Country	Methane Emissions (MMTCO ₂ E)		
	1990	2000	2010
<u>Russia</u>	335.3	252.9	273.5
<u>United States</u>	121.2	116.4	138.7
<u>Ukraine</u>	71.6	60.2	39.4
Venezuela	40.2	52.2	68.0
Uzbekistan	27.2	33.7	42.9
<u>India</u>	12.9	24.4	54.9
<u>Canada</u>	17.1	23.3	23.8
<u>Mexico</u>	11.1	15.4	22.1
<u>China</u>	0.9	1.5	4.9



Marginal Abatement Opportunities for Russia



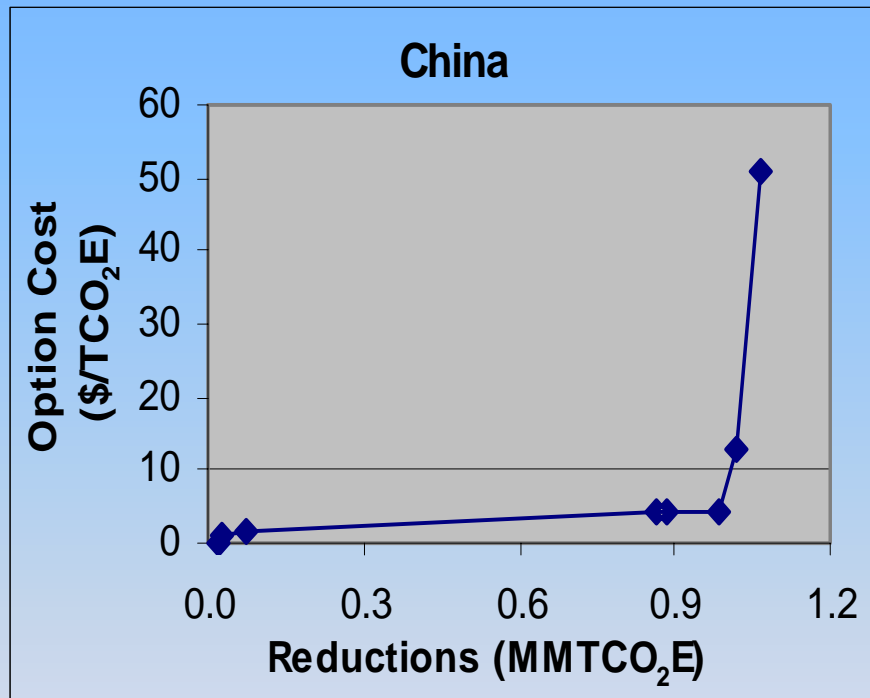
★ Under \$10 per TCO₂E, nearly 31 percent of NG-related methane emissions can be abated

★ Cost effective technologies and practices include:

- Conversion of high bleed to low bleed pneumatic devices
- Glycol flash tank separators
- Green completions
- Fuel gas retrofits of blowdown valves
- Composite wrap repair activities



Marginal Abatement Opportunities for China



- ◆ Under \$4 per TCO₂E, over 16 percent of NG-related methane emissions can be abated
- ◆ Primary cost effective abatement strategy is
 - Implementation of flaring systems
- ◆ With additional development of infrastructure, other cost effective solutions include:
 - Conversion of high bleed pneumatics to low bleed systems
 - Directed inspection & maintenance (DI&M) activities



Methane to Markets

★ These Methane to Markets partner countries are also potential locations for oil and gas sector methane emissions reduction projects

Brazil, China, Colombia, India,
Mexico, Nigeria, Poland
Ukraine, South Africa



Gas STAR & Methane to Markets

What can you do?

- ★ Methane to Markets countries and companies are encouraged to consider projects under the Partnership
- ★ Project development
 - Consider excellent opportunities and build teams
- ★ Technology transfer
 - Workshops and conference participation
 - Technology demonstration



Methane to Markets

For further information on the Natural Gas STAR Program and Methane to Markets, contact:

Roger Fernandez

1-202-343-9386

fernandez.roger@epa.gov

www.methanetomarkets.org

www.epa.gov/gasstar