

Partnering to Advance Clean Energy Development & Climate Protection: The Global Methane Initiative

1st Asia Pacific GMI Oil & Gas Sector Workshop

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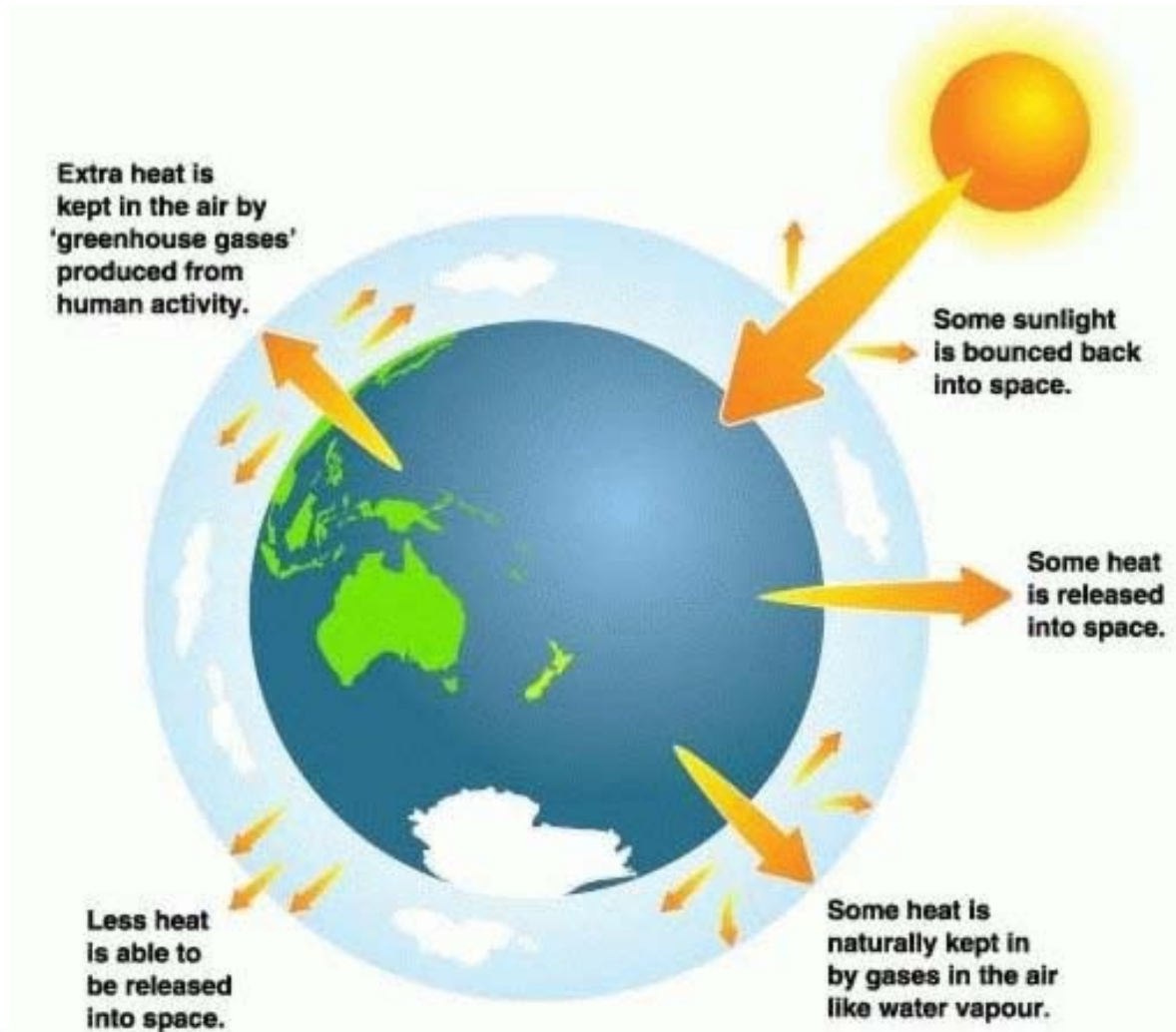


Presentation Outline

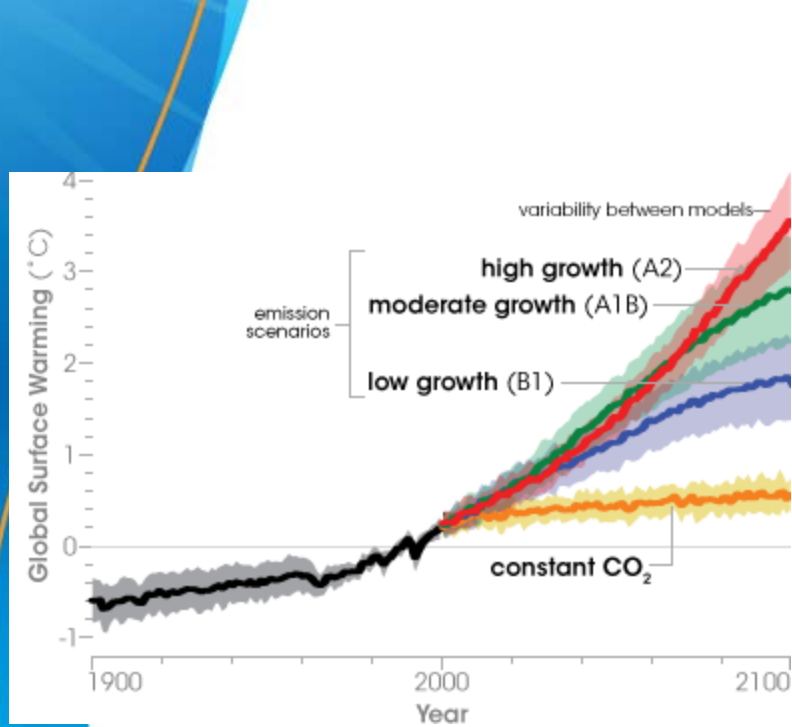
- Environmental Challenge
- Global Methane Initiative (GMI) Introduction
 - Why focus on Methane?
 - Oil and Natural Gas Methane Emissions
- Natural Gas STAR International
 - Program Overview
 - Current International Partners
 - How to Participate
 - Key Resources Available
- Conclusion



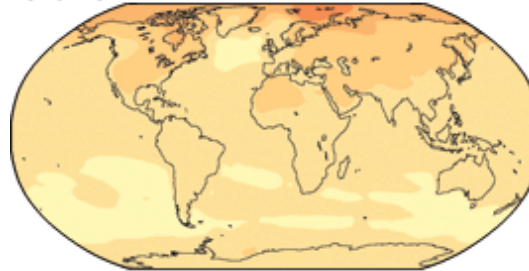
Climate Change Basics



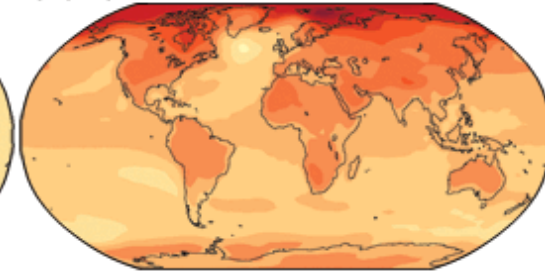
GHG Emissions & Future Temperature



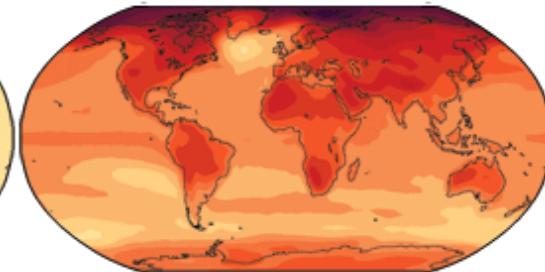
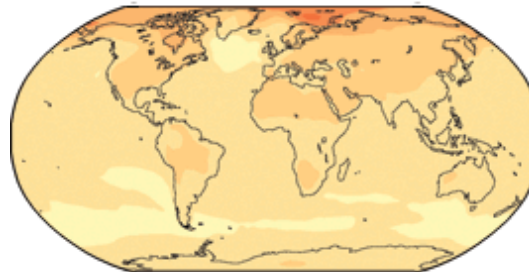
2020-2029



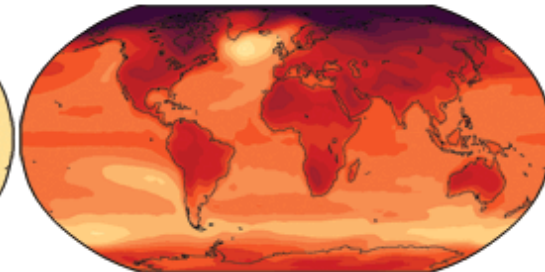
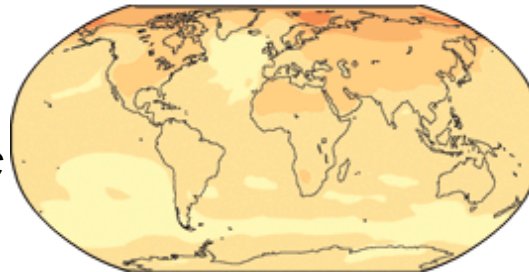
2090-2099



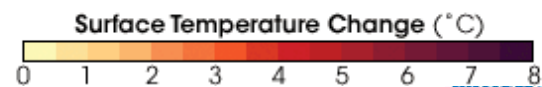
low growth (B1)



moderate growth (A1B)



high growth (A2)



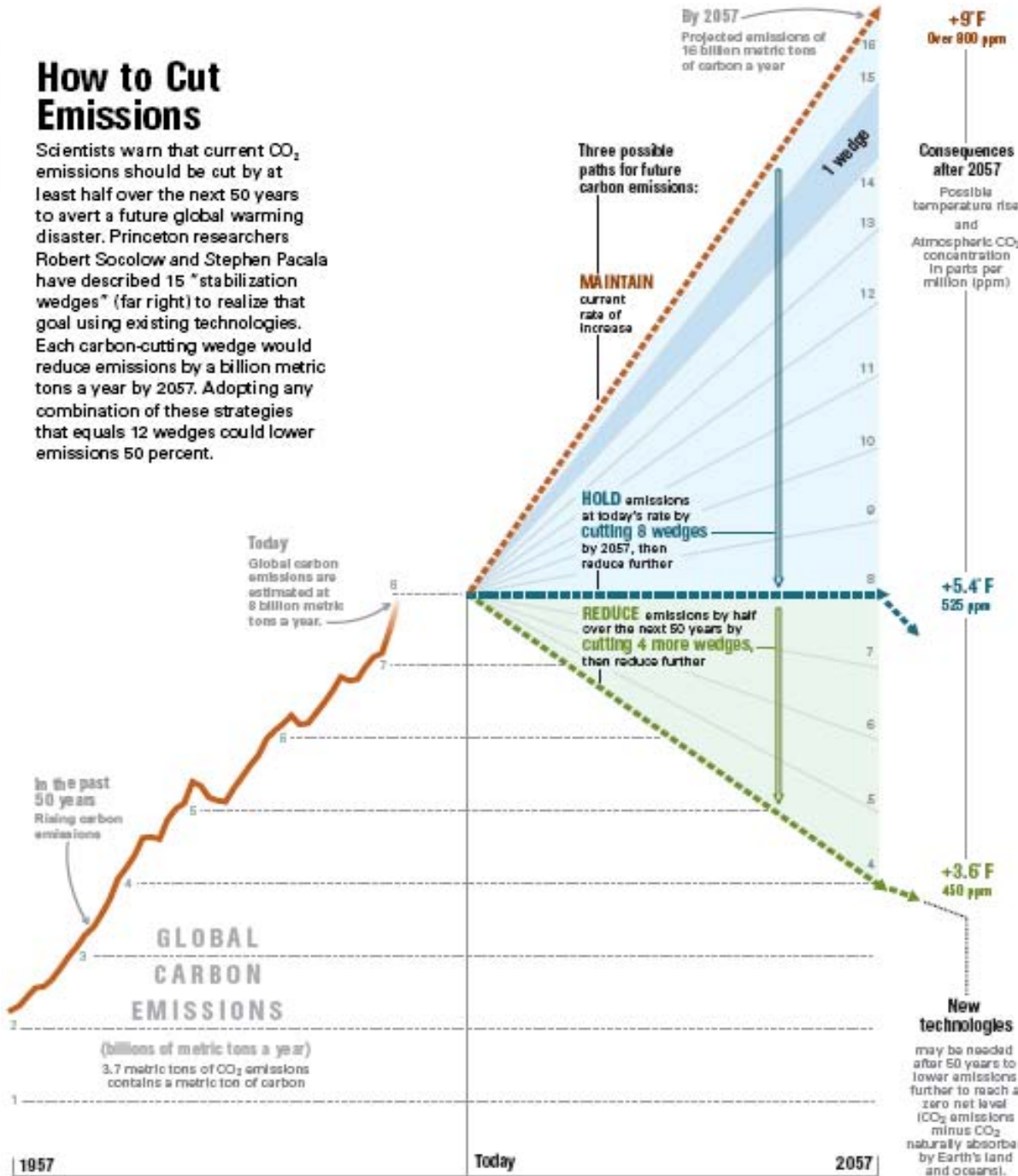
Methane Initiative

Source: [NASA Earth Observatory](http://www.nasa.gov), based on IPCC Fourth Assessment Report (2007)



How to Cut Emissions

Scientists warn that current CO₂ emissions should be cut by at least half over the next 50 years to avert a future global warming disaster. Princeton researchers Robert Socolow and Stephen Pacala have described 15 "stabilization wedges" (far right) to realize that goal using existing technologies. Each carbon-cutting wedge would reduce emissions by a billion metric tons a year by 2057. Adopting any combination of these strategies that equals 12 wedges could lower emissions 50 percent.



ONE WEDGE AT A TIME

Each strategy listed below would, by 2057, reduce annual carbon emissions by a billion metric tons.

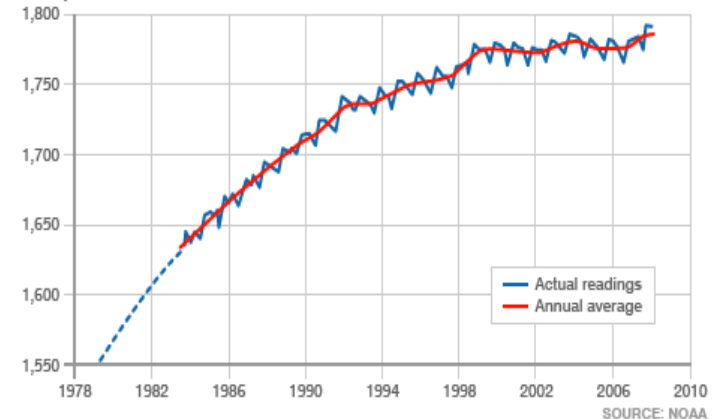
- EFFICIENCY AND CONSERVATION**
 - Improve fuel economy of the two billion cars expected on the road by 2057 to 60 mpg from 30 mpg.
 - Reduce miles traveled annually per car from 10,000 to 5,000.
 - Increase efficiency in heating, cooling, lighting, and appliances by 25 percent.
 - Improve coal-fired power plant efficiency to 60 percent from 40 percent.
- CARBON CAPTURE AND STORAGE**
 - Introduce systems to capture CO₂ and store it underground at 800 large coal-fired plants or 1,600 natural-gas-fired plants.
 - Use capture systems at coal-derived hydrogen plants producing fuel for a billion cars.
 - Use capture systems in coal-derived synthetic fuel plants producing 30 million barrels a day.
- LOW-CARBON FUELS**
 - Replace 1,400 large coal-fired power plants with natural-gas-fired plants.
 - Displace coal by increasing production of nuclear power to three times today's capacity.
- RENEWABLES AND BIOSTORAGE**
 - Increase wind-generated power to 25 times current capacity.
 - Increase solar power to 700 times current capacity.
 - Increase wind power to 50 times current capacity to make hydrogen for fuel-cell cars.
 - Increase ethanol biofuel production to 50 times current capacity. About one-sixth of the world's cropland would be needed.
 - Stop all deforestation.
 - Expand conservation tillage to all cropland (normal plowing releases carbon by speeding decomposition of organic matter).

SOURCE: ROBERT H. Socolow AND STEPHEN W. PACALA, PRINCETON UNIVERSITY (UPDATED REPORT); OAK RIDGE NATIONAL LABORATORY (GLOBAL CARBON EMISSIONS DATA); ECON BY JONATHAN GWEI; GRAPHIC BY JUAN VELAZCO, NEMART

Why Methane (CH₄)?

- Potent greenhouse gas
 - 100-year GWP = 25
 - Lifetime = 12 years
 - Most important short-lived forcer— based on emissions, accounts for >1/3 of current anthropogenic forcing
- Ozone precursor
 - Effects background ozone levels
- Clean energy source - primary component of natural gas
- Many emission sources
 - energy, agriculture & waste sectors
 - 50 - 70% of are anthropogenic
- Concentration of methane in the atmosphere has increased by 150% in the last 260 years

RISING METHANE
Parts per billion



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



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**



GMI Global Participation

- **Membership:**
 - 40 Partner countries
 - Multilateral Institutions including the ADB and IDB
 - 1000 + public and private organizations
- **Impact:**
 - Since 2004, GMI has facilitated project development at more than 600 sites around the globe



Indonesia Joins GMI

Term of Reference for the

Global Methane Initiative

Signature: _____



Bambang Dwiyanto

Head of Agency of Research and Development for Energy and Mineral Resources
Ministry of Energy and Mineral Resources of Republic Indonesia

Date: _____

28 April 2011

- Officially signed **28 April 2011**
- See Terms of Reference at <http://globalmethane.org/about/terms.aspx>



Farms and Landfills—Providing Renewable Energy



Animal Waste to Cooking Fuel in Vietnam



Landfill Gas to an Infrared Heater in Ukraine



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



Importance of Methane Emissions from Oil & Gas Sector

ECONOMIC LOSS OF A VALUABLE PRODUCT

Over 100 billion m³ of natural gas* lost annually by global oil and gas industry equates to:

- **US\$12 to \$20 billion** lost revenues
- Over 3% of worldwide net dry gas consumption

SIGNIFICANT ENVIRONMENTAL IMPACT

18% of global anthropogenic methane emissions from oil and natural gas operations

Climate change impact of worldwide vented gas (**1,165 MtCO₂e**) is almost three times as much as that of the flared gas (400 MtCO₂e)

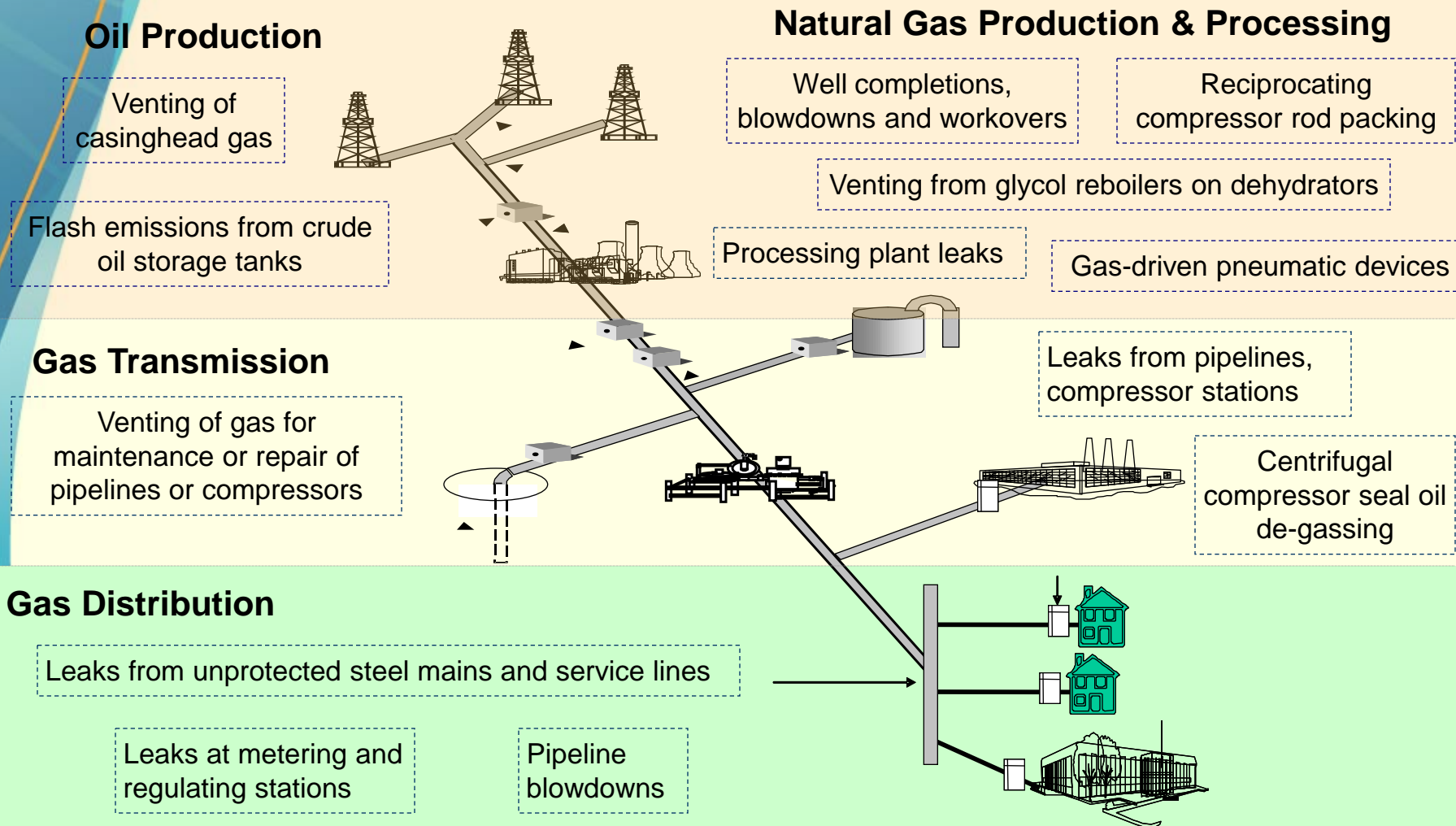
Emissions can include VOC and HAPs in addition to methane



*Methane is the primary component of natural gas



Sources of Methane Emissions from Oil and Gas Operations



Seeing is Believing!



Vented emissions are 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



14 Gas STAR International Partners



How Do Companies Participate?

- **Joining Natural Gas STAR International involves:**
 - Signing a voluntary one page Memorandum of Understanding (MOU)
 - Evaluating and implementing current and future voluntary activities that reduce methane emissions
 - Submitting an Implementation Plan within one year of joining and report activities to EPA on an annual basis
- **Benefits include:**
 - Partner companies are automatically eligible for all of the services Natural Gas STAR has available
 - Join strong and growing “Peer Learning Network”
 - Flexible participation and reporting formats; companies can participate at the level they choose, evaluating company-wide, site-specific or pilot projects



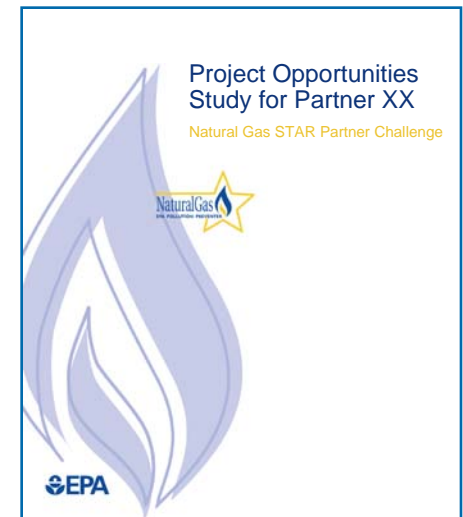
Natural Gas STAR Resources

- Resources to advance cost-effective oil & gas sector methane emission reductions:
- General technology transfer, training, and capacity building:
 - Technical documents and research outlining over 80 mitigation options, including analyses of economic, environmental and operational benefits
 - Workshops and conferences
 - Study tours



Natural Gas STAR Resources, cont.

- Individual technical assistance to help companies identify and assess cost-effective methane emission reduction opportunities
 - Analysis of estimated methane emission sources and corresponding project opportunities
 - Pre-feasibility and feasibility studies
 - Leak detection and measurement studies



New Partners Welcome!

- Enormous economic opportunity to reduce methane losses from oil & gas operations
 - Increases energy security
 - Improves air quality and industrial safety
 - Contributes to climate protection
- Cost of Inaction is significant
 - Stern Review on the
 - Economics of Climate Change
 - Losses = 5 to 20% GDP
- Collaboration expedites information sharing and reduces mitigation costs
- Support and demonstrate sustainable business practice to stakeholders



GMI Partnership-Wide Meeting

12-14 October 2011 – Krakow, Poland

- Plenary Sessions focusing on the reduction and capture of methane emissions
- Sector-Specific Site Tours
- Technical and Policy Sessions
- Steering Committee Meeting
- Networking Functions, including a special tour and dinner at the Wieliczka Salt Mine, a World Heritage Site
- For more information, please visit www.globalmethane.org/krakow



Contact Information

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

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

