

## The Global Methane Initiative (GMI)

The Global Methane Initiative (GMI) is a voluntary, multilateral partnership that aims to reduce global methane emissions and to advance the abatement, recovery and use of methane as a valuable clean energy source. GMI achieves this by creating an international network of partner governments, private sector members, development banks, universities and non-governmental organizations in order to build capacity, develop strategies and markets, and remove barriers to project development for methane reduction in Partner Countries.



Launched in 2004, GMI is the only international effort to specifically target the abatement, recovery and use of the greenhouse gas (GHG) methane by focusing on the five main methane emission sources: agriculture, coal mines, landfills, municipal wastewater, and oil and gas systems. The Initiative works in concert with other international agreements, including the United Nations' Framework Convention on Climate Change, to reduce GHG emissions. Unlike other GHGs, methane is the primary component of natural gas and can be converted to usable energy. The reduction of methane therefore serves as a cost-effective method to reduce GHGs and increase energy security, enhance economic growth, improve air quality and improve worker safety.

## Why Target Methane?

Methane (CH<sub>4</sub>), the second most important manmade greenhouse gas (GHG) after carbon dioxide (CO<sub>2</sub>), is responsible for more than a third of total anthropogenic climate forcing. It is also the second most abundant GHG accounting for 14 percent of global GHG emissions. Methane is considered a "short-term climate forcer," meaning that it has a relatively short lifespan in the atmosphere, approximately 12 years. While methane is in the atmosphere for a shorter period of time and is emitted in smaller quantities than CO<sub>2</sub>, its ability to trap heat in the atmosphere, which is called its "global warming potential," is 21 times greater than that of CO<sub>2</sub>.

Methane is emitted during the production and transport of coal, natural gas and oil. Emissions also result from the decay of organic matter in municipal solid waste landfills, some livestock manure storage systems, and certain agro-industrial and municipal wastewater treatment systems. Methane offers a unique opportunity to mitigate climate change and simultaneously increase available energy supply. However, without more stringent measures to reduce sources, methane emissions are expected to increase approximately 45 percent to 8,522 million metric tons of carbon dioxide equivalent (MMTCO<sub>2</sub>E) by 2030. GMI Partner Countries represent approximately 70 percent of the world's estimated anthropogenic methane emissions and include the top 10 methane-emitting countries. Cumulative methane emission reductions that can be attributed to GMI total nearly 128.3 MMTCO<sub>2</sub>E.

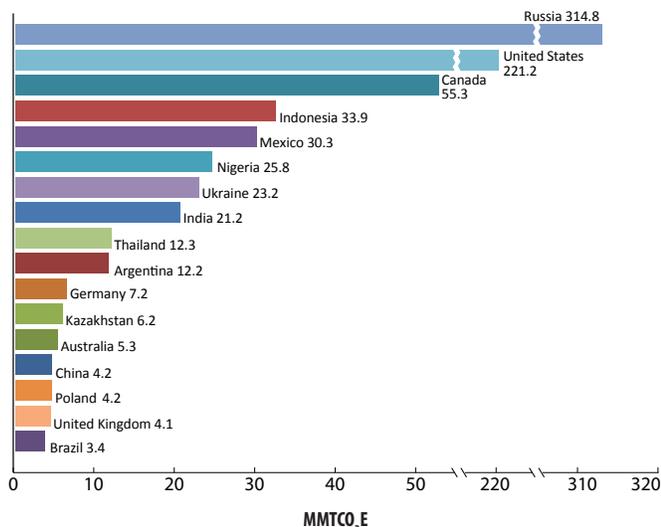
## ➔ Background on Oil and Gas Emissions

The production, processing, transmission, and distribution of oil and natural gas together form the second largest anthropogenic (manmade) source of methane worldwide, releasing an estimated 1,600 MMTCO<sub>2</sub>E of methane into the atmosphere in 2010.<sup>1</sup> Methane is emitted during normal operation, routine maintenance and system disruptions in the oil and natural gas industry. Emissions vary from facility

to facility and are largely a function of process and equipment type, operation and maintenance procedures, and equipment conditions. Although natural gas is a relatively clean source of energy, methane losses from oil and gas systems account for approximately 20 percent of total worldwide methane emissions. Figure 1 presents methane emissions from the oil and gas sector in selected GMI countries.

<sup>1</sup>U.S. EPA, 2011. *DRAFT: Global Anthropogenic Emissions of Non-CO<sub>2</sub> Greenhouse Gases: 1990–2030* (EPA 430-D-11-003), [www.epa.gov/climatechange/economics/international.html](http://www.epa.gov/climatechange/economics/international.html).

**Figure 1: Estimated Global Methane Emissions From Oil and Natural Gas in Selected GMI Countries, 2010<sup>2</sup>**



**Note:** The countries depicted in the above figure had the highest oil and natural gas methane emissions in 2010. Total oil and natural gas methane emissions in 2010 was 1,600 MMTCO<sub>2</sub>E.

Designed operational venting and unintentional fugitive emissions along the natural gas industry's supply chain represent product losses that can be avoided using readily available, cost-effective practices and technologies. Reducing methane emissions from the oil and gas industry can be a matter of making simple changes to operational practices and equipment upgrades, and can yield substantial economic and environmental benefits. Methane emission reduction projects conserve natural gas, often recover their costs in less than one year and bring about lasting productivity and environmental performance improvements.

## ➔ Recovery and Use Opportunities

In oil and gas systems, there are numerous opportunities to reduce methane emissions. Many emission reduction activities consist of relatively simple operational changes that can have a large impact for a relatively small cost. Opportunities to reduce methane emissions generally fall into the following categories:

- **Change out existing equipment.** Existing equipment can be retrofit to reduce methane emissions. For example, natural gas driven pneumatic devices are used throughout the oil and gas industry to measure and control such parameters as temperature, pressure and liquid levels. After actuation, these devices vent natural gas by design. However, high bleed devices, which vent a large volume of natural gas, can be very simply retrofitted to lower the bleed rate and significantly reduce methane emissions.

- **Improve maintenance practices and operational procedures.** Altering and improving maintenance and operational procedures can significantly reduce methane emissions with relatively little cost and effort. Directed inspection and maintenance (DI&M) programs are enhanced practices that use specialized equipment to identify and measure methane emission sources. These programs facilitate better understanding of the sources and volumes of emissions so that mitigation projects can be prioritized to achieve more efficient, cost-effective emission reductions. DI&M programs can be applied to upstream oil operations and natural gas production, processing, transmission and distribution operations in any country.
- **Study and undertake new capital projects.** Other projects require installation of new capital equipment and changes to processes to reduce methane emissions. Crude oil storage tanks often vent methane as well as other valuable hydrocarbons. A vapor recovery unit can be installed to capture that gas stream for sale or for use as fuel gas, virtually eliminating methane emissions and directing valuable hydrocarbon streams for beneficial use.

## ➔ Success Factors for Project Development

Although there are many effective ways to reduce methane emissions in the oil and gas sector, several factors are important to successful project development. Addressing these factors and facilitating project development is a core focus of GMI. By focusing international expertise and resources, GMI works with Partners to implement emission reduction projects. Some of the key support GMI provides includes:

- Engaging the international oil and gas industry to improve awareness of emission sources and volumes, informing oil and gas companies about reduction opportunities, and promoting recognition of emission prevention and mitigation as a core business opportunity.
- Facilitating and enhancing awareness and broad adoption of emission reduction technologies and practices through technology transfer of successful projects.
- Promoting flexible approaches to project opportunities, seeking to maximize economic, operational and environmental benefits and make projects profitable in areas where natural gas prices are low.
- Improving and facilitating access to capital to support project investment.
- Cooperating with Partner Countries to promote policies that encourage project development.

<sup>2</sup>U.S. EPA, 2011. DRAFT: Global Anthropogenic Emissions of Non-CO<sub>2</sub> Greenhouse Gases: 1990–2030 (EPA 430-D-11-003), [www.epa.gov/climatechange/economics/international.html](http://www.epa.gov/climatechange/economics/international.html).

## ➔ The following examples showcase the types of activities undertaken by GMI and its Partner Countries.

### **Collaboration Among GMI Partner Country Oil and Gas Companies Yields Award-Winning Research**

A report highlighting the efforts of GMI participants was selected from 240 papers to receive the “Best Paper” at the International Gas Union’s (IGU) 24th World Gas Conference, which took place in Buenos Aires, Argentina in October 2009. The paper, “Methane’s Role in Promoting Sustainable Development in the Oil and Natural Gas Industry,” discussed projects undertaken by PEMEX, Pluspetrol, Gazprom and EnCana to cost-effectively reduce methane emissions.

Case studies covering mitigation activities in the GMI Partner Countries of Argentina, Mexico, Russia and the United States described how companies are using commercially available, cost-effective technologies and practices to reduce their methane emissions. These case studies also illustrated how the methane emissions source, geography, energy market and costs can vary, but a common result is reduced emissions and economic and operational benefits. The types of projects highlighted encompass a wide range of available methane emission reduction opportunities and can vary from simple maintenance activities to major operational changes. Example projects include DI&M to identify and quantify methane emissions (enhanced management and maintenance activities), converting centrifugal compressor wet seals to dry seals (equipment upgrades), reduced emission completions to reduce venting of natural gas during the completion of hydraulically fractured wells (best operational practices), and vapor recovery unit installation to capture methane and other hydrocarbon emissions from crude oil storage tanks (capital projects requiring operational changes). While project results depend on specific operating circumstances, these GMI-promoted activities have pay-back periods that range from a few months to 3 years (based on the value of the gas saved) and consistently produce operational and environmental benefits across the global industry.

### **Outreach and Capacity Building in India**

India’s Oil and Natural Gas Corporation Ltd. (ONGC), a Natural Gas STAR International Partner, has put forth significant effort to build a strong methane emission reduction program by raising awareness, providing training and building internal capacity. In August 2007, ONGC became the first state-owned oil and gas company to join Natural Gas STAR International. In December 2007, ONGC, in cooperation with U.S. EPA, hosted a series of technology transfer workshops at four different ONGC sites. These technical workshops served to increase awareness among ONGC personnel of major methane emission sources and cost-effective emission reduction opportunities.

In the following years, ONGC collaborated with U.S. EPA to undertake pre-feasibility studies that used operational data to develop source-specific estimated methane emission inventories of 13 sites. The results of these studies allowed EPA and ONGC to prioritize locations with the greatest methane emission reduction potential to receive on-site measurement studies, which were conducted at seven sites in May 2008 and November 2009. The measurement study sites were chosen based on expected methane emissions and potential mitigation opportunities, and were representative of ONGC’s varied operations. The measurement study results and methane recovery project recommendations (e.g., routing vents to vapor recovery units and performing DI&M) were presented to the ONGC Board of Directors in September 2008. It was estimated that these projects could save over 30 million cubic meters of methane emissions from these seven facilities. Through a variety of activities, these emissions have been reduced over the last two years: 3.2 million m<sup>3</sup> from 2008 to 2009 and 4.7 million m<sup>3</sup> from 2009 to 2010.

In 2009, ONGC formed an internal measurement study team with four members and 10 asset coordinators to further its methane emission identification and reduction efforts. The team participated in hands-on measurement techniques training and two longer duration (repeat) measurements were carried out in June 2009. As part of its longer-term action plan, the company initiated fugitive emission mapping of all ONGC facilities, with the goal of creating a comprehensive fugitive emission inventory. In early 2010, ONGC shared its experiences and achievements with fellow oil and gas colleagues at the GMI Partnership Expo in New Delhi, and in fall 2010, was named the Natural Gas STAR International Partner of the Year. The Natural Gas STAR International Partner of the Year award is based on methane emission reductions achieved, implementation of a variety of technologies and practices, and support of overall Program activities, initiatives, and outreach. Each year, EPA recognizes the efforts and achievements of outstanding partners.

Since joining GMI and Natural Gas STAR International, ONGC has made considerable progress to advance its GHG management program and continues to build its internal expertise such that it is able to share technical information with all affiliates. ONGC also contributes to larger international technology transfer through presenting on their experience and successful case studies at GMI conferences.



*ONGC representatives receiving Natural Gas STAR International Partner of the Year Award in fall 2010.*

## ➔ GMI at Work

The GMI Oil and Gas sector has undertaken numerous activities to support the identification, reduction and recovery of vented and fugitive methane emissions from oil and natural gas systems in Partner Countries. Through capacity-building workshops and trainings, pre-feasibility and on-site measurement studies, and the development of critical tools and resources, the sector works to reduce the informational, institutional and financial barriers to emission reduction technologies and practices.

Some of the Oil and Gas sector's accomplishments include:

- **Completed pre-feasibility and measurement studies at more than 35 sites in seven countries.** GMI works directly with oil and gas companies to help them assess their methane emission reduction opportunities. Desktop assessments use operational data to estimate the volume of methane emissions from key emitting sources. On-site measurement studies identify and quantify actual emissions levels to further guide project evaluation. Results of these studies are used to develop specific technical recommendations, including anticipated emissions reductions, operational benefits, and full economic cost-benefit analyses of methane emission reduction projects.
- **Conducted 24 international technology transfer workshops and conferences in 13 countries.** These events allow for Partners to share information on successfully implemented methane emission reduction projects and are targeted to oil and gas companies as well as other stakeholders, such as government agencies. Industry experts present successful case studies to provide technical detail on recommended technologies and practices, including operational considerations, economic analyses and environmental benefits.
- **Developed technical articles with seven oil and gas companies in five countries.** GMI representatives work jointly with oil and gas company partners to write technical articles that are published in industry journals or presented at industry conferences.
  - Brazilian oil and gas companies Devon and Shell collaborated with GMI to develop the paper “Designing the Ideal Offshore Platform Methane Mitigation Strategy,” which was presented at the Society of Petroleum Engineers (SPE) International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production, 12-14 April 2010 in Rio de Janeiro, Brazil.

- Comgas, the natural gas distribution company of Sao Paulo, worked with GMI to write and publish the technical journal article “New Measurement Data Has Implications For Quantifying Natural Gas Losses From Cast Iron Distribution Mains,” which covers Comgas’ measurement of natural gas leakages from their cast iron distribution network and the mitigation activities they have undertaken to reduce those losses. The article was published in the September 2009 edition of *Oil and Gas Pipeline Journal*.

- **Lead Natural Gas STAR International (NGSI).** Under the framework of GMI, NGSI was launched in 2006 to expand on the success of the Natural Gas STAR domestic program and promote methane emission mitigation activities in oil and natural gas operations worldwide. Through this program, U.S. EPA collaborates with international oil and natural gas companies to identify, analyze, promote and track methane emission reduction projects from their worldwide operations. A key component of this program is annual partner reports of voluntarily undertaken methane emission reduction activities. These reports facilitate quantification of methane emission reductions and promote technology transfer of innovative methane emission reduction projects. Since the program’s inception, partners have reported 77.8 billion cubic feet (Bcf) or 35.5 MMTCO<sub>2</sub>E in methane emissions reductions.

## ➔ Looking Forward

The Oil and Gas sector will continue to promote methane emission reductions through the following activities:

- **Continuing education and outreach.** Strategic activities continue to be defined with the clear goal of working with Partner Countries to identify and implement methane emission reduction project opportunities. A key element of these activities is the ongoing education and outreach to the international community on the economic benefits of reducing methane emissions from oil and natural gas systems. Outreach occurs through technical and marketing materials, on-site and online workshops, and the provision of tools and up-to-date technical documents on the Natural Gas STAR International and GMI websites.
- **Conducting technical feasibility studies.** GMI will continue sponsoring studies to evaluate the technical feasibility of implementing methane emission reduction technologies and practices at many facilities worldwide. Benefits include increased profits, improved efficiency, reduced global warming and other air pollution, and enhanced national energy security.

For additional information,  
please visit the GMI website  
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