Natural Gas STAR Partner Update

Published Summer 2013

See You in October — Natural Gas STAR 2013 Annual Implementation Workshop

Please plan to join us October 28-30, 2013, for the Annual Implementation Workshop in San Antonio, Texas. The workshop will feature an exhibitor area and facility tours highlighting methane emissions detection, measurement, and reduction methods. Conference updates, information about no-cost exhibitor space, and registration information are posted on the Natural Gas STAR website at www.epa.gov/gasstar/workshops. The Global Methane Initiative's (GMI's) Oil and Gas Subcommittee is co-locating its next meeting with the Annual Implementation Workshop so be sure to join us for a truly worldwide perspective on the industry!

It's Not Too Late — Natural Gas STAR Is Still Accepting Annual Reports for 2012 Activities!

Both Natural Gas STAR and Natural Gas STAR International Partners must submit annual reports documenting the past calendar year's methane emissions reduction activities. By reporting emission reduction activities, companies build a lasting record of their accomplishments that can be shared with peers, customers, the public, and other interested stakeholders. Companies can also report methane reduction activities from past years if they have not been reported to the Natural Gas STAR Program previously.

The Natural Gas STAR Program provides information on cost-effective methane emission reduction opportunities through a variety of documents, including *Lessons Learned Studies, Partner Reported Opportunities Fact Sheets*, Technical Presentations, and *Partner Update* articles.

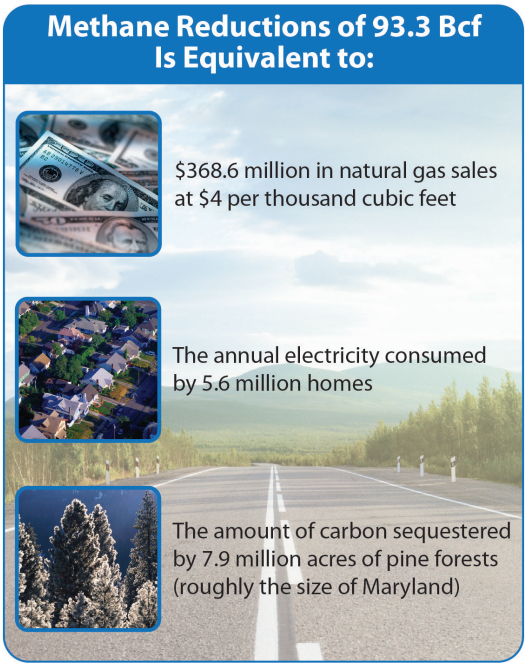
To learn more, visit the Recommended Technologies and Practices page at www.epa.gov/gasstar.

Natural Gas STAR has various templates and tools to assist Partners with annual reporting:

- The standard reporting forms are available, in both PDF and MS Word, at www.epa.gov/gasstar/tools/program-forms.html.
- There is also an online reporting system through which Partners can quickly and easily submit annual methane emissions reduction data to EPA, at https://EPAGasSTAR-reporting.icfwebservices.com.

If you need general assistance, please contact your assigned EPA Program Manager or STAR Service Representative. If you need assistance with the online reporting system, please contact ICF technical support staff member Julie Arthur at julie.arthur@icfi.com.

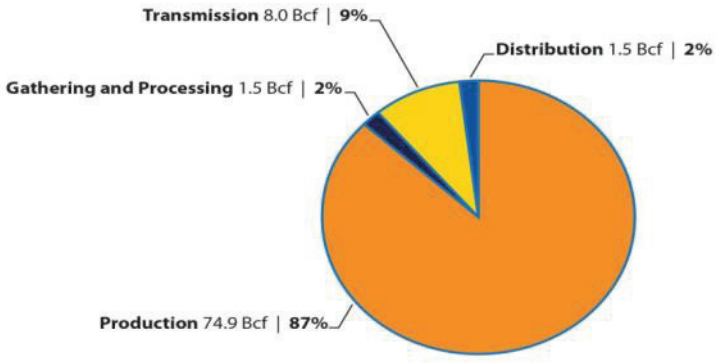
Partners Continue to Reduce Methane Emissions



Each year, Natural Gas STAR collects information on the emission reduction activities undertaken by Partners during the previous calendar year, thereby creating a permanent record of their voluntary accomplishments in reducing methane emissions. While information is still currently being collected on 2012 calendar year activities, in 2011 Natural Gas STAR and Natural Gas STAR International Partners reported over 93.3 billion cubic feet (Bcf) in methane emission reductions!

U.S. Reductions in 2011

Domestic Partners reduced 85.9 Bcf of methane emissions in 2011. The oil and gas production sector reported the largest reductions, accounting for 87 percent of the total reductions. The emissions reduction breakdown by each sector (Production, Gathering and Processing, Transmission, and Distribution) can be seen in the pie chart.



2011 U.S. Natural Gas STAR Program Partners' methane emissions reduction (85.9 Bcf) by sector

Examples of technologies and practices used to reduce methane emissions included:

- Replacement of high-bleed pneumatic devices
- Replacement of reciprocating engines at compressor stations with gas turbines
- Installation of flash tank separators on glycol dehydrators
- Implementation of third-party damage prevention programs

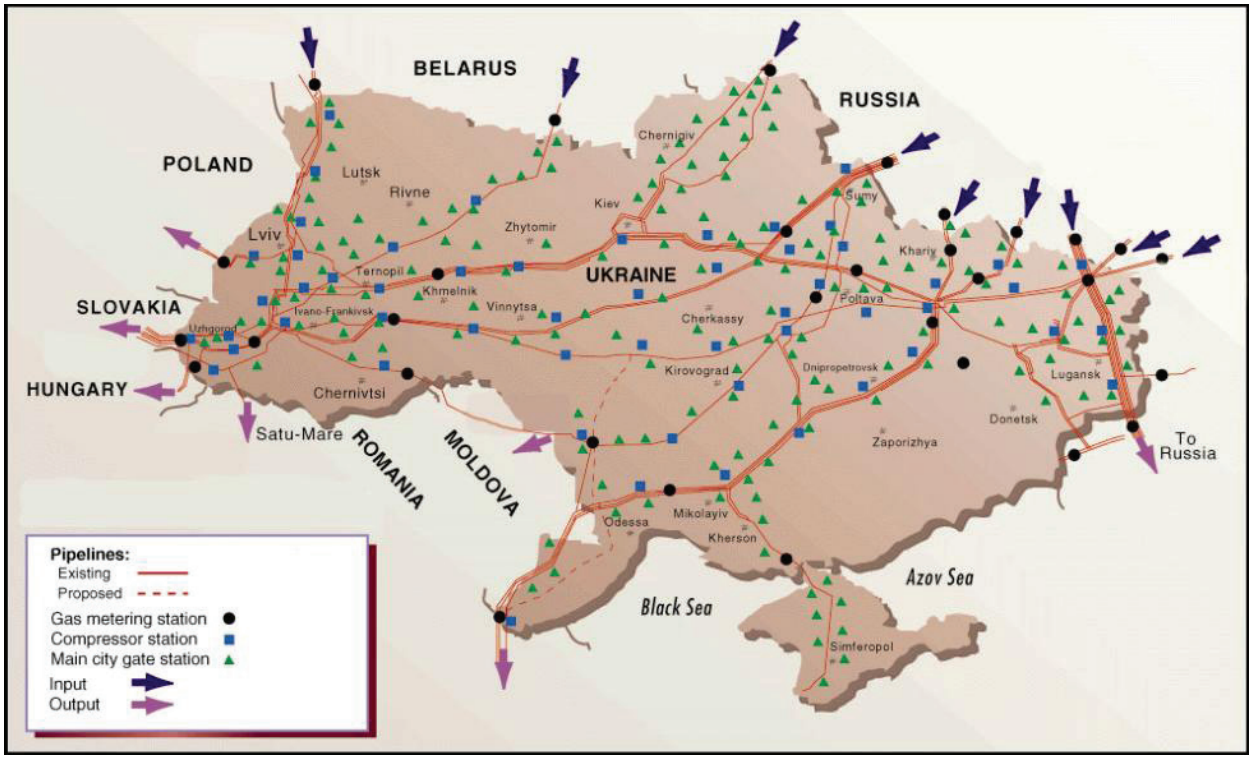
Emissions reductions are achieved primarily through use of proven technologies to capture natural gas that would normally escape to the air from wells, storage tanks, and other equipment. These reductions result in significant environmental benefit by reducing methane, a potent greenhouse gas, as well as reducing volatile organic compound (VOC) emissions, a precursor to ground level ozone pollution.

International Reductions

Natural Gas STAR International Partners reported 7.4 Bcf in methane emissions reductions for a cumulative total of 85.2 Bcf since the inception of Natural Gas STAR International Program. To date, international Partners have undertaken methane emissions reduction activities in Argentina, Brazil, Canada, Chile, Equatorial Guinea, India, Nigeria, and Poland. For 2011, these companies reported methane emissions reductions from the implementation of 23 technologies and practices.

Ukrtransgaz Reduces Methane Emissions

In 2012, Ukrainian gas transportation system operator Ukrtransgaz announced its efforts to improve infrastructure and is achieving a reduction in methane losses. Strategically located between Russia and its Western and Central European neighbors, the Ukrainian natural gas pipeline system transports the largest share of Russian gas exported to the region. Both the volume of gas transported and the existing system infrastructure create important opportunities for methane mitigation projects.



Source: *Oil and Gas Journal Vol. 95, Issue 52*

As one of the 14 countries that founded Methane to Markets in 2004 (the predecessor to GMI), Ukraine has collaborated with EPA and the Natural Gas STAR Program since 2007 to identify methane emissions reduction opportunities and implement projects in the natural gas sector. The Ministry of Fuel and Energy of Ukraine endorsed the joint action and signed a protocol to establish a working group to assess potential investment in methane leak mitigation. This led to Naftogaz (Ukrtransgaz's parent company) joining EPA's Natural Gas Star International.

The collaboration has focused on several mitigation efforts, including identifying and minimizing leaks from valves via directed inspection and maintenance (DI&M). Cherkasytransgaz, the largest subsidiary

of Ukrtransgaz, has been very successful at identifying and repairing gas leaks and serves as a model for other subsidiaries to quantify their methane emissions and identify broader emissions reductions opportunities. For more than a decade Cherkasytransgaz's DI&M team has helped reduce compressor station leaks in the Cherkassy portion of the system by nearly 50 percent as compared to 2006 emissions levels. This impressive success equates to more than $5 million in gas saved from 2007 to 2011 at current gas prices of about $400 per 1,000 cubic meters.

To replicate Cherkasytransgaz's success, the company worked closely with EPA to investigate and deploy state-of-the-art analytical tools and organize staff training opportunities. This effort has led to the establishment of a company-wide emissions monitoring system and a DI&M program. In 2011, Ukrtransgaz created six innovative "mobile laboratories" with field emission monitoring and measurement equipment and staff trained to implement DI&M. The mobile laboratories will identify and assess additional cost-effective mitigation projects.

Further examples of Ukrtransgaz and Cherkasytransgaz's methane mitigation successes include:

- Cherkasytransgaz applied high-quality sealant materials, reducing fugitive gas losses by close to 1.5 million cubic meters in 2009 alone.
- Ukrtransgaz implemented pipeline and joint repair methods, using a technology that functions like a composite wrap. The company conducted these and other repairs using pipeline pumpdown techniques in about 40 locations over the past three years. Since 2008, these repair methods saved more than 560 million cubic meters of gas (third-party verified). Due to the program's success, the application of this pipeline wrap is expanding rapidly.
- Ukrtransgaz has also undertaken a program to replace gas-fired turbines with electric compressors. The company has outfitted 17 such compressors, reducing natural gas consumption by approximately 385 million cubic meters and eliminating methane leaks from the fuel supply system by an estimated 20 million cubic meters in 2011. The actual comprehensive climate benefits from this program are likely to be even greater, since the reported reductions do not account for the avoided methane emissions resulting from incomplete fuel combustion.

Ukrtransgaz is applying an innovative repair method: installation of a two-layer sleeve on a high diameter gas pipeline. From left to right: (a) rings and sleeves are adjusted, (b) sleeve is assembled, (c) sleeve is welded (a chain of several sleeves covering multiple defects is also shown).

Ukrtransgaz is now preparing to invest in further system-wide methane emissions reduction opportunities, including:

- Purchasing up to six mobile compressors to expand the use of pipeline pumpdown techniques.
- Specifying dry seals for all new compressors and utilizing seal gas from existing compressors with wet seals.

- Installing low-bleed pneumatics.
- Installing electric starters on compressors.

Additionally Ukrtransgaz will complete its first system-wide methane emissions study. Since EPA's engagement in Ukraine began in 2007, the company has reduced its cumulative methane emissions by roughly 597 million cubic meters and avoided the fuel use of another 385 million cubic meters. Added together, the emissions reductions and fuel savings are valued by the company at more than $415 million.

More information about Ukraine's participation in GMI is posted on the Initiative's website at https://www.globalmethane.org/partners/ukraine.aspx.

Ecuador Explores Methane Recovery and Use Options

With the assistance of a U.S. EPA grant, a team from Escuela Superior Politécnica del Litoral (ESPOL) in Ecuador recently completed its assessment of methane emissions from wells of a marginal declining oil field in the Ancón region. The work included a pre-feasibility analysis (https://www.globalmethane.org/activities/actDetails.aspx?ID=341) for the potential use of the gas as a domestic energy source for a small nearby community, replacing the current practice of using heavily subsidized liquefied petroleum gas. The team conducted an inventory and took measurements from wellheads and storage tanks to determine the quantity and quality of the gas being currently vented at the Ancón oilfield, and explored options for collection of the gas from neighboring wells, as well as storage and distribution of the gas by pipes to homes in the community.

In August, ESPOL will present this project at the Latin American and Caribbean Conference for Engineering and Technology in Mexico.

Dr. Alfredo Barriga demonstrates gas leak measurements on an oil well.

In the Ancón Oil Field there are approximately 2,800 wells, of which 1,000 to 1,500 wells are abandoned or suspended from operation, depending on the season. It is these abandoned or "orphan" wells that were the focus of the project, which was to identify technological and economic methane reduction options for improving the capture and use of well casinghead gas. In this study, wells and storage tanks were targeted for evaluation as other unit operations had already been refurbished. Generally other sources for methane reduction would include: pumphouses, compressor stations, and dehydration and gas extraction plants.

Three cases were studied based on methane gas collection through a piping network from orphan wells, including storage tanks, compressor stations, production stations, and other facilities. They were:

1. Distribution of piped gas to community households, utilizing the recovered methane collected by trucks from approximately 100 wells.
2. Distribution of piped gas to community households, collecting recovered gas in a treatment plant from approximately 100 wells. No trucks are needed.
3. Construction of about 1,200 plugs assemblies in different diameters and the plugging of the wells.

A total of 100 wells were measured using the High-Flow sampler, including productive wells, wells temporarily suspended from production, and abandoned wells. The sampled volume of fugitive methane gas totals 27,065 standard cubic feet (scf) per day, averaging 270 scf per day per well, with a standard deviation of 190 scf per day. This value indicates the wide variation of emissions levels among sampled wells,

spanning from zero to 648 scf per day. The study ultimately concluded that capping the wells was the most economically feasible option, and a proposal for consideration by the government is currently being developed.

Welcome to New Natural Gas STAR Partners

The Natural Gas STAR program now has 19 international and 116 domestic Partners, with the latest joiners shown below. Partners are helping the oil and natural gas sector adopt cost-effective technologies and practices that improve operational efficiency and reduce emissions of methane—creating a win-win for all.

Central Valley Gas Storage, LLC

Central Valley Gas Storage (CVGS) is a subsidiary of AGL Resources Inc. CVGS offers natural gas storage in north central California.

Ecumed Petroleum Limited Tunisia

Ecumed Petroleum Limited is a team of local oil industry professionals who manage the day-to-day operations of Candax Energy Inc.'s Tunisian assets.

OGX Petróleo e Gás Ltda.

OGX Petróleo e Gás Ltda., the largest private sector company in Brazil's oil industry, has a portfolio of potential resources estimated at 10.8 billion barrels of oil equivalent. Approximately 75 percent of OGX's resources are oil, and 21 percent are in gas. OGX has 33 exploratory blocks covering 42,600 square kilometers in Brazil and Colombia.

Petronet LNG Limited

Formed as a joint venture by the Indian government to import liquefied natural gas (LNG) and set up LNG terminals in the country, Petronet LNG Limited has set up the country's first LNG receiving and regasification terminal in Dahej, Gujarat, with a capacity of 10 million metric tons (Mmt) per year.

PTT Public Company Limited

PTT is Thailand's largest oil and natural gas operator engaged in a full range of oil and gas exploration, processing, transmission, and distribution. PTT manages more than 2,700 million standard per cubic feet per day (MMscfd) of processing capacity and delivered over 4,100 MMscfd of gas to customers in 2011. The company also operates 3,635 kilometers of natural gas transmission pipelines, with 2,198 kilometers being subsea pipelines.

EPA's Non-CO_2 Programs Branch Chief Pamela Franklin and PPT's Pipit Hongjinda sign the Natural Gas STAR International memorandum of understanding.

VICO Indonesia

VICO signing a memorandum of understanding with EPA to join Natural Gas STAR International.

VICO Indonesia, a joint venture led by BP and ENI, is an oil and gas exploration and production company with assets in the Badak field in East Kalimantan, Indonesia. VICO's current production is 700 MMscfd of gas and 20 thousand barrels per day of oil and condensate.[1]

Recent Events

Distribution Technology Transfer Workshop Cosponsored with AGA

Natural Gas STAR jointly sponsored a Distribution Technology Transfer Workshop with the American Gas Association (AGA) on May 23, 2013, in conjunction with the AGA's Operations Conference and Biennial Exhibition in Orlando, Florida. In addition to seven speakers, more than 30 industry professionals collaborated in a spirited peer-based exchange of information on topics that included:

- Distribution Sector Emissions Identified in the 2012 U.S. Greenhouse Gas Inventory
- Methane Emissions and Mitigation Technologies
- New Study by Gas Technology Institute on Plastic Emissions
- ONEOK's Experience in Optimizing Compressor Operations

One highlight was Pacific Gas and Electric Company's discussion of its use of the Picarro Surveyor™ technology to identify and quantify leaks in the field. The device is a vehicle-mounted, gas leak detector that measures and maps natural gas and methane plumes in the air as the vehicle drives through neighborhoods.

Proceedings from the Distribution Transfer Workshop are available on the Natural Gas STAR website www.epa.gov/gasstar/workshops/tech-transfer. A summary of the AGA Operations Conference & Biennial Exhibition can be accessed at www.aga.org.

AGA has been a strong supporter of EPA's Natural Gas STAR Program since its inception. EPA thanks AGA and its members for their efforts in promoting the use of best practices and technology advancements to reduce emissions from natural gas systems.

Picarro's leak detection technology is installed on cars, which allows surveyors to drive through neighborhoods to check for natural gas leaks.

[1] VICO Indonesia. (2013). Overview. Retrieved July 8, 2013, from http://www.vico.co.id/overview

Methane Expo 2013

In March, GMI hosted Methane Expo 2013 in Canada, with 450 attendees representing 44 countries, including delegates from GMI's Partner governments, representatives from the private sector, NGOs, and academia. Launched in 2004, GMI is the only international effort to specifically target methane abatement, recovery, and use by focusing on the five main methane emission sources: agriculture, coal mines, municipal solid waste, oil and gas systems, and wastewater. The Initiative works in concert with other international agreements, including the United Nations' Framework Convention on Climate Change, to reduce greenhouse gas emissions.

The Expo included exhibits from methane-related technology and service providers, and nearly 100 methane emissions reduction project opportunities and success stories that showcased tangible accomplishments of GMI. The overall Methane Expo 2013 event also included a site tour, cross-cutting technical and policy sessions, and a track for the oil and gas sector. The sessions addressed a variety of topics, including:

- Corporate Experience in Addressing Methane Emissions
- Approaches to Methane Emission Detection and Measurement
- Panel Discussion on Collaborating with GMI to Identify and Measure Methane Emissions
- Best Practices for Capturing and Utilizing Methane Emissions in the Oil and Gas Industry
- Best Practices for Evaluating and Reducing Emissions from Oil and Associated Gas Production

The presentations from the Oil and Gas Technology and Policy sessions can be found at www.globalmethane.org.

Approximately 15 Expo attendees visited the FortisBC Energy Inc. (formerly Terasen Gas) $200-million LNG peak shaving facility at Mt. Hayes on Vancouver Island, which provides LNG storage capacity for 1.5 Bcf of natural gas. The need for this facility was driven by the increasing natural gas demand and peak usage in the region. Given the site's distance from gas sources and limited geology for underground storage, an LNG peak shaving facility was selected. FortisBC contracted with CB&I in 2008 to engineer, procure, construct, and commission the facility in its entirety. The facility first removes CO_2 and water from the plant feed gas. After pretreatment, the gas is liquefied for storage in the tank using a proprietary mixed refrigerant liquefier design. Gas is sent back to the pipeline using fired heat LNG vaporization. The facility was commissioned in the spring of 2011 and is the newest Greenfield LNG peak shaving facility in North America.

Expo attendees visited FortisBC Energy's LNG Facility on Vancouver Island.

Next to the Vancouver Convention Centre, representatives from FLIR and Heath Consultants gave attendees a hands-on demonstration of their FLIR GF Series and OPGAL EyeCGas infrared cameras. These cameras can be instrumental in detecting natural gas leaks and participants enjoyed testing out the equipment and using the cameras to view controlled leaks.

Additionally, the Oil and Gas Subcommittee met during the Expo. Co-chairs Michael Layer (Canada) and Javier Bocanegra Reyes (Mexico) presided over this meeting, which was attended by 25 participants representing eight countries and the European Commission. Country delegates gave brief updates on sector-specific activities in support of their country's GMI strategic goals and the charge to the Subcommittee. The representatives from the European Commission reported on their new action plan and offered possible areas for collaboration with GMI. Minutes are available on the GMI website.

Subcommittee meeting attendees also focused on links between Subcommittee work and other relevant international initiatives and partnerships. These include the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (www.unep.org/ccac), which in January launched an Oil and Gas Initiative and issued a statement signed by 13 CCAC Partner Ministers. The Initiative will focus on reducing short-lived climate pollutants (methane and black carbon) from venting, leakage, and flaring of natural gas from global oil and gas operations. Supported by Australia, Canada, Denmark, France, Italy, Nigeria, Norway, Sweden, the United States, the United Kingdom, the United Nations Environment Programme, and the World Bank, among others, the Oil and Gas Initiative seeks to (1) accelerate and expand global methane and black carbon emissions reductions, building upon and scaling-up achievements of the Natural Gas STAR International Program, GMI, and the Global Gas Flaring Reduction Partnership, and (2) showcase progress by companies in addressing short-lived climate pollutants.

Leak Detection and Measurement Technologies Featured at Expo

One of the most well-attended sessions from the oil and gas track showcased information on leak detection and measurement technologies. The presenters and participants discussed the importance of emission detection and measurement, accurate and verifiable emissions estimates, standardized and reproducible opportunities, and implementation plans.

An exhibit hall was set up to display success stories. Oil and gas posters, which can be found at www.globalmethane.org/expo/posters.html, included:

Name of Project (Country)	Organization	Emissions Reduction*
TAQA North Well Site Emissions Reduction Program (Canada)	TAQA North Ltd.	1,686,000 m3/22,600 t CO_2e per year
ARC Resources—Low Emission Tight Gas Well Sites (Canada)	ARC Resources Ltd.	750,000 m3/10,000 t CO_2e per year
Zero Emissions Technology (Canada)	Blair Air Systems	387 mtCO_2e per installation
Cap-Op GHG Offset Aggregation Platform (Canada)	Cap-Op Energy	1,000,000 t CO_2e per year
CNRL Heat String Pump Retrofit (Canada)	Canadian Natural Resources Ltd.	739 e3m3/9,020 mtCO_2e/year
Pneumatic Controller Retrofit Project (Canada)	Devon Canada Corporation (Natural Gas STAR Partner)	714,000 m^3 natural gas/9,800 tCO_2e per year
Reduction of Methane Venting from a Gas Transmission Pipeline System (Canada)	Spectra Energy (Natural Gas STAR Partner)	41,784 tCO_2e per year
Quantifying Future Benefits of Implementing Cost-Effective Emissions Reduction Technologies in Natural Gas Production (China)	Princeton University	360 bcm/35 mmt CO_2e per year by 2030
International Collaboration to Advance Emissions Reductions (China)	PetroChina Changqing Oilfield Company	15,000 mtCO_2e per year

Name of Project (Country)	Organization	Emissions Reduction*
The Norwegian Way of Developing and Cooperating for Solutions in the Oil and Gas Industry (Norway)	Statoil	Not applicable
Detection and Monitoring of Fugitive Methane Emissions using Passive and Active Infrared Advanced Technologies (United States)	Heath Consultants	>25,000 mcf per year, 10,000 $mtCO_2e$/compressor station
Centrifugal Compressor Seal Oil De-gassing Emissions Recovery (United States)	BP (Natural Gas STAR Partner)	45,900 tCO_2e per compressor per year

*Estimated/actual average annual emissions reductions resulting from proposed or implemented project. These figures are based on data provided by the site owners and operators. GMI cannot take responsibility for the accuracy of this data.

Methane Emission Reduction Workshop in Indonesia

In May 2013, Edy Hermantoro, Director General of Oil and Gas for the Indonesian Ministry of Energy and Mineral Resources, and Benjamin Wohlauer, Deputy Economic Counselor at the American Embassy, welcomed more than 60 participants from industry, government, and academia to a half-day GMI workshop. Scott Bartos, EPA's Program Manager for Southeast Asia, introduced the Natural Gas STAR International Partnership in Jakarta, Indonesia. He invited Indonesian companies to join this collaborative effort with EPA to assess and deploy cost-effective technologies and practices to minimize methane emissions. Notable speakers included Sugeng Riyono with LEMIGAS, Prijo Hutomo with Star Energy, Hemant Mallya with ICF International, and A.B. Chakraborty, who shared the impressive work that Oil and Natural Gas Corporation (ONGC) (India) is undertaking across all of its facilities to find, measure, and reduce methane losses to the atmosphere.

In the News

President Obama Announces Climate Action Plan

On June 25, U.S. President Obama announced his Climate Action Plan that will "[keep] the United States of America a ... global leader in the fight against climate change." Climate change represents one of the major challenges of the 21st century, but—as you, our partners, have long demonstrated—we can meet this challenge in a way that advances our economy, our environment, and public health all at the same time.

We encourage you to learn more about the President's plan—and to continue to work with us in the days ahead to achieve our goals. For more information, visit www.epa.gov/climatechange.

Oil and Natural Gas Air Pollution Standards

In March 2013, EPA proposed updates to 2012 Performance Standards for VOCs for storage tanks used in crude oil and natural gas production to facilitate compliance with the standards and clarify requirements. The proposed changes reflect recent information showing that more higher volume storage tanks will be coming on line than the agency originally estimated. EPA held a public hearing on Monday, April 29, 2013, on these proposed updates and accepted public comment on this proposal for 30 days after it was published in the *Federal Register*. EPA took final action on these proposed updates on August 5, 2013. In addition, the Agency is continuing to evaluate other issues raised in the petitions and intends to address those by the end of 2014.

For more information visit EPA's Office of Air and Radiation's oil and gas's regulatory actions webpage at www.epa.gov/airquality/oilandgas/actions.html.

World Resources Institute's "Clearing the Air" Webinar

In April 2013, the World Resources Institute (WRI) held a webinar presenting its working paper *Clearing the Air: Reducing Upstream Greenhouse Gas Emissions from U.S. Natural Gas Systems* (www.wri.org/publication/clearing-the-air). James Bradbury, lead author, summarized three main focus areas: (1) documenting knowledge, to date, about methane emissions from natural gas systems; (2) highlighting emissions reduction potential; and (3) explaining the roles of current and future state and federal policies. The paper acknowledges that understanding climate implications of emissions from this sector depends on developing updated, comprehensive measurement studies to better understand leakage rates. The paper highlights the role of cost-effective technologies (i.e., technologies with a payback period under three years) in substantially reducing greenhouse gas emissions from the upstream sector to ensure that fuel-switching to natural gas is beneficial from a climate standpoint. It cites Natural Gas STAR as a provider of valuable information on proven technologies that reduce leaks throughout the natural gas value chain.

IEA Releases Report Outlining Measures to Slow Impacts of Climate Change

The International Energy Agency (IEA) has released a new World Energy Outlook Special Report entitled *Redrawing the Energy-Climate Map* (www.iea.org/publications) that identifies global energy measures that can slow the impacts of climate change. The report presents four policy measures to "keep the door open to the 2 °C target through to 2020 at no net economic cost," known as the "4-for-2 °C Scenario." One of these four key measures is the minimization of methane emissions from upstream oil and gas production. According to Fatih Birol, Chief Economist of IEA, "…Through very simple, in many cases, measures taken by the oil and gas companies, we could easily halve the methane emissions, with an additional investment of 0.5 percent of the investment that the companies are doing for oil and gas upstream sector."

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The Natural Gas STAR Partner Update newsletter is a semi-annual publication. Please send comments, news, and article ideas to Jerome Blackman for consideration in the next issue.