



Offshore Operations—Identifying Emissions Reductions Opportunities

There are thousands of offshore natural gas rigs and wells within U.S. borders, with the outer continental shelf of the Gulf of Mexico alone containing more than 3,000 structures. Every year, companies operating these platforms look for ways to increase production, decrease their operating costs, and reduce their environmental impact. Capturing methane emissions through Gas STAR endorsed practices can help companies with all three of these objectives.

Identifying Emissions Sources

Like land-based operations, offshore platforms have many cost-effective methane emissions reduction opportunities. Even at

gas prices of \$3/Mcf, capturing and utilizing these emissions could quickly turn profitable.

Primary Sources of Fugitive Emissions

1. Pneumatics using pressurized natural gas—including pressure and level controllers and gas operated diaphragm pumps and piston pumps used for chemical injection.
2. Crude oil condensate storage and surge tanks that vent to the atmosphere.
3. Low-pressure cold vents, which receive natural gas from pressure vessels (e.g., chemelectric heater treaters, low-pressure separators, flash tanks).

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Partner Profile El Paso Pipeline Group

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Traversing the entire United States, the El Paso Pipeline Group's interstate transmission system is a key player in the natural gas arena. The company's 47,500 miles of pipe are owned and operated by five subsidiary companies: El Paso

Natural Gas, Colorado Interstate Gas, ANR Pipeline, Tennessee Gas Pipeline, and Southern Natural Gas. Since joining Natural Gas STAR in 1993, these companies together have achieved methane emissions reductions of nearly 36 Bcf.

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Technology Spotlight

BP Reduces Methane Emissions Using “Smart Automation Well Venting”

Not only is BP one of Natural Gas STAR's top reporting partners, the company also continues to push the envelope on reducing its methane emissions. Recently, BP reported to Gas STAR an innovative technology that reduces well venting by more than 50 percent. BP's state-of-the-art technology, known as the “Smart Automation Well Venting System,” combines standard hardware (e.g., remote terminal units (RTUs) and programmable logic controllers (PLCs)) with proprietary software developed by BP.

Most automated gas-producing wells have RTUs, but those with plunger lift technologies also have PLCs, to control the plunger's cycle time by opening and closing the well's flow valve. Although PLCs typically use limited program logic to cycle the plunger system and lift fluids out of the tubing, a well's producing characteristics can change from season-to-season, and even day-to-day.

BP developed an artificial intelligence program that allows the PLC to “learn” a well's performance characteristics and adapt the cycle frequency and duration to optimize well performance. BP upgraded the PLC to store additional historical well production data and algorithms. The program “learns” from experience by monitoring and analyzing data

from wellhead instruments (e.g., tubing pressures, sales line pressure), resulting in greater gas production and minimized venting.

Data analysis is an important part of keeping production activities as efficient as possible. Therefore, wellhead instrument data for each RTU-equipped well is relayed to a host computer, where operators review the data and take measures to address any performance deficiencies or operating problems. The Smart Automation Well Venting System provides operators with an exception report when well venting or production volumes are more or less than pre-set objectives.

BP also realized additional benefits by installing this type of RTU and PLC technology on non-plunger lift, low-pressure gas wells. The program minimizes vent volumes and methane emissions by optimizing shut-in periods and atmospheric venting to expel accumulated liquids the conventional way. BP's application of smart automation well venting to its low-pressure gas wells has proven successful in increasing gas production in the San Juan Basin, and has also led to reduced methane emissions.

The company estimates that methane emissions from well venting episodes in this region have been reduced by more than 50 percent. The Smart Automation Well Venting System was installed on

2,200 wells and has saved the company an estimated 4 Bcf per year. Savings are determined by comparing before and after unloading volumes and their frequency. Orifice meters can be used to establish gas blow down flow rates and volumes for each type of well conditions and formation.

The system must be installed on each well to optimize flow and reduce methane emissions. Field personnel require training in its use, and engineering time is needed to customize the system to each field's producing formations and well parameters. The Smart Automation Well Venting System can be installed at a cost of approximately \$5,400 per well. Costs and engineering time are justified by increased profits and reduced emissions.

Other similar nonproprietary programs are available.

For further information on BP's Smart Automation Well Venting System or to share an innovation with the Natural Gas STAR Program, please contact Roger Fernandez at fernandez.roger@epa.gov or (202) 343-9386.

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4. Glycol dehydrators, still column vents, and flash tanks that are routed to the atmosphere.
5. Compressor seals for axial and reciprocating compressors.
6. Leaking safety relief, pressure control, and isolation valves.
7. Inefficient flares.

Reducing Fugitive Emissions

After identifying emissions sources, companies should determine the technical and economic feasibility of implementing emissions reductions technologies and practices. Following are some management practices and technologies that will not only help companies reduce methane emissions at their offshore facilities, but will also lead to improved operational efficiency.

Companies can:

- ★ Measure source gas from cold vent systems and flare systems with ultrasonic measurements to determine the flowrate of routine releases. This activity helps companies determine all sources of natural gas routed to the vent and reduce source emissions. Typical sources routed to cold vents and flares include: compressor seals, pneumatics, pressure relief devices and pressure vessels, atmospheric tanks, and glycol dehydrator flash tanks.
- ★ Use acoustic meters to determine through-valve leaks so that they can be repaired. Typically these leaks are from pressure relief devices, pressure vessels, and atmospheric tanks that are routed to a cold vent system, all of which emit emissions into the atmosphere via a pipe or to flare. Further

information can be found at epa.gov/gasstar/pro/useultra-sound.pdf.

- ★ Reduce the operating pressure of pressure vessels that dump to an atmosphere tank. Companies can determine the amount of gas vented by the tank using an ultrasonic meter.
- ★ Use vapor recovery systems (VRUs) to recover vent gas from low-pressure systems (i.e., low-pressure separators and low-pressure vessels). Further information can be found at epa.gov/gasstar/install.htm.
- ★ Lower heater-treater temperature to reduce fuel use and flash losses. Further information can be found at

epa.gov/gasstar/pro/lower-heater-treater-temp.pdf.

- ★ Optimize facility operations by reducing fuel use for engines that drive compressors, generators, and pumps. Companies can consider implementing a method that uses air/fuel ratio controllers, which reduces the amount of unburned methane emitted from the exhaust.
- ★ Optimize electrical generation systems on a platform to reduce natural gas fuel use. This action reduces the amount of unburned methane emitted from the exhaust.
- ★ Route facility blowdowns to lower pressure systems where possible, and where gas can be collected and recovered.

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Calendar

2004 GAS STAR TECHNOLOGY TRANSFER WORKSHOPS

Production

- ★ **Rocky Mountain Region—Colorado Springs, Colorado**
June 29, 2004
Co-sponsored by SGA (more to come)
- ★ **Corpus Christi, Texas**
Fall 2004
More information TBA
- ★ **Houston, Texas**
September 21, 2004
Co-sponsored by Exxon Mobil

Processing

- ★ **Houston, Texas**
September 22 or 23 (to be determined)
Co-sponsor TBA

Transmission

- ★ **TBA**

Distribution

- ★ **New Orleans, Louisiana**
October 17, 2004
Co-sponsored by AGA

2004 GAS STAR ANNUAL MEETING

Offshore Platforms

- ★ **Houston, Texas**
June 8, 2004
Co-sponsored by Shell

- ★ **Houston, Texas**
Warwick Hotel
5701 Main Street, Houston, Texas
October 25-27, 2004

For further information, contact Roger Fernandez at fernandez.roger@epa.gov

El Paso Pipeline Group

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EPA recognized the El Paso Pipeline Group as Transmission Partner of the Year in 2003 for outstanding implementation of the Natural Gas STAR Program.

In recent years, the company's successes in reducing emissions can be largely attributed to El Paso Pipeline Group's Natural Gas STAR implementation coordinator and Plant Services' principal engineer, John Cordaway, who began managing the company's Gas STAR Program in 2000. During his tenure, he has spearheaded an effort to expand

"The key to implementing a successful emissions reduction program is to recognize what can reasonably be accomplished and to focus on what you can get done—targeting your efforts and doing more with less."
—John Cordaway

the company's fugitive leak emissions program, organized the company's Gas STAR Program across all five pipeline companies to enhance reporting and tracking, and evaluated vendor products that reduce fugitive emissions. He also provides regular updates to El Paso Pipeline Group's management on the company's emissions reduction successes and gas savings.

Efficient Use of Resources

To successfully implement El Paso Pipeline Group's Gas STAR Program, Cordaway created a team of operating



staff to communicate and organize data concerning the Gas STAR Program across El Paso Pipeline Group's regulated pipelines. Overseeing Gas STAR for all five pipelines at once enables El Paso Pipeline Group to share research results across all the pipeline companies—optimizing time, resources, and money. The El Paso Pipeline Group identified as many sources of fugitive emissions as possible—regardless of size. Cordaway helped the pipelines prioritize and then initially resolve the most significant sources. This allowed the company to eliminate the most sub-

In recognition of his outstanding efforts, Natural Gas STAR recognized John Cordaway as the Program's 2002 Implementation Manager of the Year.

stantial emissions and achieve the greatest environmental impact.

To maximize the company's efforts, Cordaway collected data from the five pipeline companies to determine the top fugitive emission sources. Cordaway's research showed that there are four primary sources for emissions:

- ★ Compressor rod packing leakage
- ★ Unit blowdown events
- ★ Unit valve leakage
- ★ Station blowdown events

Together, leaks from these sources comprise approximately 80 percent of all El Paso Pipeline Group transmission fugitive emissions.

In addition, Cordaway's research revealed that only a few leak sources within each category account for 60 percent or more of lost gas—emphasizing that the company will achieve its greatest reductions in emissions and environmental impact by focusing resources on areas with the most significant sources of emissions. Cordaway notes that an added benefit of this research is that it brought a heightened

In addition to fugitive emissions reductions, El Paso Pipeline Group realizes significant methane emissions reductions by conducting pipeline pumpdowns before maintenance, repairs, and equipment replacement. This practice resulted in the savings of 1.4 Bcf of gas in 2002 alone.

awareness to the real value of leaks, which led to a change in how the company implements its Gas STAR Program by focusing resources on these top four sources.

Reaching for the Stars

El Paso Pipeline Group avoids using default values to quantify emissions reductions; instead, the company prefers to utilize a measurement program. According to Cordaway, this approach "is the best and most accurate, providing a real assessment of what's happening." By employing contractors equipped with high-flow samplers, El Paso Pipeline Group is able to report measurable reductions to the Natural Gas STAR Program.

El Paso Pipeline Group continues to

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El Paso Pipeline Group

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research additional ways to expand its fugitive emissions program. This year the company plans to evaluate optical imaging leak detection. Optical imaging technology is not new to upstream industries (e.g., production and processing plants especially in the oil refinery and petrochemical industries),

“Participation in Natural Gas STAR presents great opportunities to do good things for the environment and increase efficiency.” —John Cordaway

but until this point it has been used sparsely throughout the gas transmission sector. This technology is based on the principles of infrared light and optics to create an image (e.g., photos and videos) of emission plumes—in this case, gas leaking from compo-

nents. Gas imaging can offer more cost-effective use of resources (e.g., labor and equipment) and can allow screening of hundreds of components per hour—covering an entire facility in a few hours—thereby allowing for quicker identification and repair of leaks.

Cordaway also plans to continue his work with manufacturers/vendors to develop economical, reasonably priced methane leak indicators to reduce fugitive emissions. At the October 2003 Gas STAR Technology Transfer Workshop, Cordaway reported that new, low-cost technologies are being developed to greatly improve leak detection and measurement. El Paso Pipeline Group has tested several new technologies in the past year including a portable device for measuring packing leaks as well as a reciprocating compressor packing leak detector.

Management Buy-in Is Critical to a Successful Program

Cordaway attributes much of El Paso Pipeline Group's success in reducing methane emissions to management's strong support of Natural Gas STAR and the culture of El Paso employees who want to operate safely, cost-effectively, and have a minimal impact on the environment. Because El Paso Pipeline Group's management team believes in the value of the Program, the pipeline companies have focused on the implementation of this measurement program. According to Cordaway, El Paso Pipeline Group's effort to reduce fugitive emissions along the transmission system is more than economically sound—it is also environmentally sound.

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- ★ Implement sealed flare systems, which allows vapor recovery upstream of the seal.

For more information about these technologies or how to implement Natural Gas STAR Best Management Practices (BMPs) and Partner Reported Opportunities (PROs), please contact Roger Fernandez at fernandez.roger@epa.gov or (202) 343-9386.



A Natural Gas STAR Technology Transfer Workshop focusing on offshore platforms will be held June 8, 2004 in Houston, Texas. The workshop is co-sponsored by Shell Exploration & Production Company.



Program Expansion

Partner Reported Opportunities (PROs)— Significant Economic Opportunities for Gas STAR Partners

In addition to the core set of Gas STAR best management practices (BMPs), EPA encourages partners to evaluate and implement other cost-effective practices, process changes, or technologies to reduce methane emissions. To date, Gas STAR partners have reported nearly 80 different Partner Reported Opportunities (PROs). Unfortunately, not all partners are implementing or reporting the cost-effective PROs applicable to their operations.

Based on the data reported in 2003, EPA recently analyzed all PROs and identified the “top 5 under-utilized PROs” for each industry sector based on potential methane savings and payback. (See table.)

As partners consider how their companies can expand their methane emis-

What Are PROs?

PROs are activities and technologies, beyond BMPs, that can be implemented to further reduce methane emissions and improve operational efficiencies. Partners have reported more than 80 PROs and have used them either as a one-time reduction or as part of their long-term emissions reduction strategy. As more PROs are reported, there are more technological solutions that Natural Gas STAR can share with its partners. A complete listing of all reported PROs can be found on the Program’s Web site at epa.gov/gasstar/pro/index.htm.

Top Under-Utilized PROs

Production

- ★ Install Vapor Recovery Units
- ★ Install Plunger Lifts
- ★ Install Electric Compressors/Pumps/Motors
- ★ Install Instrument Air Systems
- ★ Consolidate Tank Batteries

Distribution

- ★ Reduce System Pressure/Install Clocking Solenoids and Smart Regulators
- ★ Redesign Blowdown/Alter ESD Practices
- ★ Use Gas Main Flexible Insert Liners
- ★ Reinject Blowdown Gas
- ★ Install Excess Flow Valve

Transmission

- ★ Replace Wet Seals With Dry Seals
- ★ Install Vapor Recovery Units
- ★ Use Fixed/Portable Compressors for Pipeline Pumpdown
- ★ Monitor/Replace Compressor Rod Packing Systems
- ★ Use Composite Wrap Repair

Processing

- ★ Reroute Glycol Skimmer Gas
- ★ Install Vapor Recovery Units
- ★ Recover Condensate Vapors
- ★ Install Electric Compressors/Pumps/Motors
- ★ Install Instrument Air Systems

sions reduction program, EPA encourages them to take advantage of these and other PROs. When reviewing this list, partners could benefit by asking several key questions, such as:

1. Has the company already implemented this PRO? Was it reported to Natural Gas STAR?
2. Why hasn’t the company implemented this PRO? Is it applicable to its operations and cost-effective?
3. This is just the Top 5, what other PROs could the company be implementing?

Partners should also keep in mind that they are not limited to these PROs or the others listed on the Gas STAR Web

site. **Any voluntary activity, practice, or process change that resulted in reduced methane emissions can be included in a partner’s annual report.**

Three new PROs were reported in 2003. EPA is currently developing PRO fact sheets for these practices, which will provide Gas STAR partners with additional information to determine applicability, costs, and benefits. The new PROs reported include:

Replace Dehydrator with Methanol Injection. (Processing)—Western Gas Resources’ field operations replaced a glycol gas dehydrator on their low-pressure gas gathering system with methanol

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Partner Reported Opportunities (PROs)

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injection, which has proven to be a simpler, more efficient method of controlling gas hydrate formation. This activity eliminated the glycol dehydrator's methane and VOC emissions. After the successful pilot, 75 units were changed out. In addition, the methanol ignition process was solar powered, providing additional environmental benefits.

- ★ Methanol injection equipment can be installed for approximately \$5,000 per unit, and average emissions reductions per installation are more than 3 MMcf/year.

Replace Compressor Cylinder

Unloaders. (Transmission)—To reduce fugitive methane emissions, Great Lakes Gas Transmission replaced compressor cylinder unloaders, which has led to fewer compressor shutdowns. Common sites of fugitive emissions on reciprocating compressor cylinders include: (1) area around unloader covers, (2) cylinder unloader and clearance pocket unloader packings, and (3) unloader gland. The current state-of-the-art unloader design includes improvements in unloader cover design and utilization of a multi-O-ring design

for the unloader gland that prevents gas loss during normal operation.

- ★ The project, which cost \$4,000 per unit to implement, resulted in a quick payback with an estimated methane savings of 14 MMcf/year for two units.

Install Pumpjacks on Wells Lifting Low Water Volumes.

(Production)—On 45 low-pressure gas wells, ConocoPhillips installed pumpjacks to unload low water volumes from the wells to prevent them from loading-up and ceasing to produce. This technology eliminates the need for the operators to manually blow-down the wells to the atmosphere for up to one hour per day per well. The use of electric-fired motors instead of gas-fueled engines to run the pumpjacks also results in significant methane savings and reduced maintenance costs.

- ★ The company reported that this effort cost approximately \$14,000 per well (not including the cost of the units) and resulted in more than 43 MMcf/year of methane emissions being eliminated.

Why Report PROs?

Reporting PROs is important for a variety of reasons. Companies can:

- ★ Create a permanent record of emissions reductions.
- ★ Share activities with peers.
- ★ Receive recognition for efforts.

Substantial methane emissions reduction opportunities are available to Natural Gas STAR partners. Gas STAR urges all partners to utilize PROs to the greatest extent possible to reduce methane emissions. Gas STAR has developed more than 50 PRO fact sheets to help partners learn about these innovative technologies and practices and how industry peers implemented them. In addition, there are always more opportunities to reduce emissions—any activity, practice, or process change that reduces a company's methane emissions is considered a PRO and can be implemented to expand an emissions reduction program.

PROs offer Natural Gas STAR partners further opportunities to reduce their methane emissions. Please remember to report on PROs during the upcoming reporting season.



Natural Gas STAR is pleased to welcome two new partners: Enbridge Energy Partners and The Houston Exploration Company.

Enbridge Energy Partners owns crude oil, liquid petroleum, and natural gas midstream businesses. The Natural Gas STAR Program welcomed Enbridge as a Gathering and Processing Partner in January, 2004. Please visit their Web site at enbridgepartners.com.

The Houston Exploration Company is a natural gas and oil company. The Natural Gas STAR Program welcomed Houston Exploration as a Production Partner in January, 2004. Please visit their Web site at houstonexploration.com.



Enbridge Energy Partners: Denise Hamsher, Rick Greenawalt, Fred Whitted, Brady Dodson, Chris Kaitson, Roger Fernandez (EPA), and Rich Adams



The Houston Exploration Company: Roger Fernandez (EPA) and David Williams

Online Reporting—Streamlining the Reporting Process

Fast and easy annual reporting is just a mouse click away. The Natural Gas STAR Web site provides partners with a convenient alternative to filling out hard copy annual reporting forms.

How To Report Online

From the Natural Gas STAR home page, epa.gov/gasstar, partners can click on Documents, Tools, and Resources, then on Online Tools, and finally on Online Annual Reporting Forms, leading to the partner login screen. Once there, partners can simply enter their e-mail address and password and then begin to file a Natural Gas STAR annual report. Partners that have forgotten their password can contact Roger Fernandez at fernandez.roger@epa.gov or (202) 343-9386.

By completing the forms online, partners eliminate the unnecessary time spent printing, faxing, or mailing their reports to EPA. More than half of reporting Gas STAR partners took advantage of convenient online reporting in 2003.

Partners must remember to save reports frequently—the system will automatically shutdown after 45 minutes of inactivity and unsaved entries will be lost.

How do partners benefit from online reporting?

- ★ **Streamlines the reporting process.** By filing an annual report electronically, it is submitted directly to EPA, eliminating paper

documents. Once partners hit the “Submit” button, they can be confident that EPA has safely received it.

- ★ **Automatically performs methane emissions reductions calculations.** Both standard and default emissions factors are provided in the online reporting tool—partners use the calculations that best fit their needs depending on how much information is known. Calculating the emissions reductions, value of gas, and cost savings in this way allows partners and EPA to be confident that data in reports are correct and uniform.
- ★ **Allows partners to save and return to partially completed reports, allowing more than one person to contribute, review, and edit the data in more than one login session.** In many cases, numerous employees are asked to complete the online forms. Reports can then be saved allowing managers to review the data. The online system enables managers to simply edit the online forms rather than having to rewrite or enter data from paper reports. After the report is completed, the Web site allows partners to view reports for verification. Before submitting to EPA, partners can click on the View button in the top toolbar enabling them to see the entire report and print copies for their records.

- ★ **Provides secure data transfer.** The online reporting system is password protected. EPA understands that some of the information contained in an annual report could be sensitive business information. EPA has taken the necessary steps to ensure online security for partners using online reporting. EPA will not share any of the information contained in the annual reports (whether submitted electronically or in hard copy format) with any other party without partners' permission.

Online reporting has proven to be a more convenient means of reporting and a more powerful tool than traditional means to both EPA and Gas STAR partners. If you have not tried electronic reporting yet, what are you waiting for?

March marks the beginning of the 2004 Natural Gas STAR reporting season. Partners can visit epa.gov/gasstar to access the online reporting tool or download the new 2003 reporting forms. Please submit annual reports to EPA by April 30, 2004.



Q: How can I estimate the value of vent gas from storage tanks?

A: Companies can realize significant savings by capturing vent gas from storage tanks. Companies are paid on the BTU content of the gas. Storage tank vent gas typically has a BTU content of 1,500 to 2,000 BTU per standard cubic feet (BTU/SCF). A company can expect to save up to \$730,000 per year by capturing vent gas from a typical tank battery using a vapor recovery unit (VRU) assuming a gas price of \$5 per million BTU (MMBTU) and an average leak rate of 200,000 SCF per day*:

$$\begin{aligned} &(200,000 \text{ SCF/day}) \times (2,000 \text{ BTU/SCF}) \times \\ &(1 \text{ MMBTU}/10^6 \text{ BTU}) \times (\$5.00/\text{MMBTU}) \times \\ &(365 \text{ days/year}) = \\ &\$730,000/\text{year} \end{aligned}$$

* 200,000 SCF/day is an estimate based on real time ultrasonic measurements.

For more information, see VRU Lessons Learned at epa.gov/gasstar/install.htm and Gas STAR's PRO fact sheets on tank technologies at epa.gov/gasstar/pro/index.htm.

Have a question for the next issue of the Natural Gas STAR Partner Update? Contact Kevin Tingley at tingley.kevin@epa.gov.



Nippon Steel Corp., Sumitomo Corp., and Gazprom to Reduce Methane Emissions from Russian Transmission System

Nippon Steel Corp. and Sumitomo Corp. will coordinate efforts with Gazprom, the world's largest gas producer, to repair its aging pipeline system. This \$300 million undertaking is estimated to begin in 2008 and will yield an estimated 5 million tons of CO₂ emissions reductions per year.

The full article is available through the World Business Council for Sustainable Development (WBCSD) Web site at wbcSD.org/plugins/DocSearch/details.asp?type=DocDet&DocId=3840

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