U.S. EPA Greenhouse Gas Reporting Rule, New Source Performance Standards, and Methane Emissions Reduction Opportunities

Meeting of Canadian Flaring and Venting Regulators Forum
Winnipeg, Manitoba
13 to 14 June 2012

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Global Methane Initiative – Oil & Gas
Natural Gas STAR International

Agenda

- EPA methane emissions reduction opportunities
  - Regulatory
    - U.S. GHG Reporting Program
    - U.S. Oil and Gas New Source Performance Standards
  - Voluntary
    - Global Methane Initiative
    - Example case studies

U.S. GHG Reporting Program

- 40 Code of Federal Regulations (CFR) Part 98 requires reporting of greenhouse gas (GHG) emissions and other relevant information from certain source categories in the United States
  - Better understand relative emissions of specific industries, and of individual facilities within those industries
  - Better understand factors that influence GHG emission rates and actions facilities could take to reduce emissions

- Primary purpose: *to collect data to guide development of policies and programs to reduce emissions*

- Does not require control of GHG emissions

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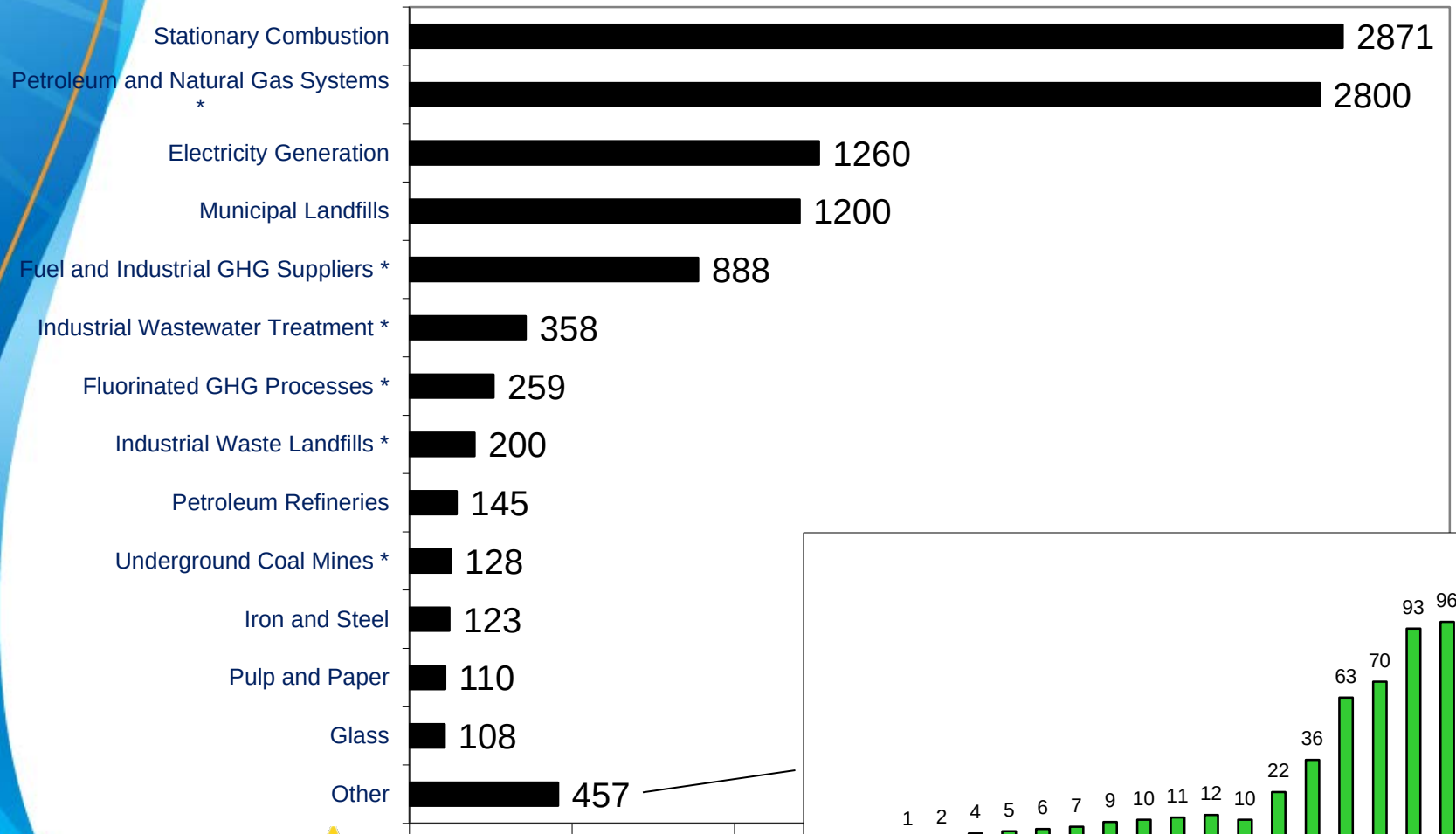
U.S. GHG Reporting Program

* Approximate (first reports due Sep 2012)



U.S. GHG Reporting Program

- Direct emitters of GHGs with emissions equal to or greater than 25,000 metric tons CO_2e/year
- Annual reporting of GHG by:
  - Direct emitting source categories
  - Suppliers of certain products that would result in GHG emissions if released, combusted or oxidized.
- Requires reporting by 41 industrial categories.
- Direct reporting to EPA electronically
- EPA verification of emissions data

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U.S. GHG Reporting Program

- **Petroleum & Natural Gas Systems** (Subpart W)
  - Estimated to cover 2,800 U.S. facilities
    - Onshore petroleum and natural gas production
    - Offshore petroleum and natural gas production
    - Natural gas processing
    - Natural gas transmission compressor stations
    - Underground natural gas storage
    - Liquefied natural gas (LNG) storage
    - LNG import and export terminals, and
    - Natural gas distribution
  - Reporting for 2011 emissions are due in September 2012.

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U.S. GHG Reporting Program

- Each facility must report:
  - CO_2 and CH_4 emissions from equipment leaks and vented emissions
  - CO_2, CH_4, and N_2O emissions from gas flares by following the requirements of Subpart W
  - CO_2, CH_4, and N_2O emissions from stationary and portable fuel combustion sources in the onshore production industry segment following the requirements in Subpart W
  - CO_2, CH_4, and N_2O emissions from stationary combustion sources in the natural gas distribution industry segment following the requirements in Subpart W
  - CO_2, CH_4, and N_2O emissions from all other applicable stationary combustion sources following the requirements of 40 CFR 98 Subpart C (General Stationary Fuel Combustion Sources)

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U.S. GHG Reporting Program

- Onshore petroleum and natural gas production (18 source types):
  - Natural gas pneumatic device venting
  - Natural gas driven pneumatic pump venting
  - Acid gas removal vent
  - Dehydrator vent
  - Well venting for liquids unloading
  - Gas well venting during well completions and workovers with hydraulic fracturing
  - Gas well venting during well completions and workovers without hydraulic fracturing
  - Onshore production storage tanks
  - Well testing venting and flaring
  - Associated gas venting and flaring
  - Flare stacks
  - Centrifugal compressor venting
  - Reciprocating compressor rod packing venting
  - Other emissions from equipment leaks
  - Population Count and Emissions Factor
  - Enhanced Oil Recovery hydrocarbon liquids dissolved CO_2
  - Enhanced Oil Recovery injection pump blowdown
  - Onshore Petroleum and Natural Gas Production and Natural Gas Distribution Combustion Emissions

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- Offshore petroleum and natural gas production (1 source type):
  - Vented, Equipment Leaks and Flare Emissions Identified in BOEMRE GOADS Study
- Onshore natural gas processing plants (7 source types):
  - Acid gas removal vent
  - Dehydrator vent
  - Blowdown vent stacks
  - Flare stacks
  - Centrifugal compressor venting
  - Reciprocating compressor rod packing venting
  - Other emissions from equipment leaks
- Onshore natural gas transmission compression (6 source types):
  - Natural gas pneumatic device venting
  - Blowdown vent stacks
  - Transmission storage tanks
  - Centrifugal compressor venting
  - Reciprocating compressor rod packing venting
  - Other emissions from equipment leaks

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- Underground natural gas storage (5 source types):
  - Natural gas pneumatic device venting
  - Centrifugal compressor venting
  - Reciprocating compressor rod packing venting
  - Other emissions from equipment leaks
  - Population Count and Emissions Factor
- Liquefied natural gas (LNG) storage (4 source types):
  - Centrifugal compressor venting
  - Reciprocating compressor rod packing venting
  - Other emissions from equipment leaks
  - Population Count and Emissions Factor
- LNG import and export equipment (5 source types):
  - Blowdown vent stacks
  - Centrifugal compressor venting
  - Reciprocating compressor rod packing venting
  - Other emissions from equipment leaks
  - Population Count and Emissions Factor
- Natural gas distribution (3 source types):
  - Other emissions from equipment leaks
  - Population Count and Emissions Factor
  - Onshore Petroleum and Natural Gas Production and Natural Gas Distribution Combustion Emissions

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U.S. Oil and Gas New Source Performance Standards

- EPA finalized **New Source Performance Standards (NSPS)** and **National Emission Standards for Hazardous Air Pollutants (NESHAP)** for the oil and natural gas industry on April 17, 2012
- Standards would:
  - Reduce emissions of smog-forming volatile organic compounds (VOCs), and air toxics including the carcinogen benzene.
  - Significant environmental co-benefit by reducing methane emissions from new and modified wells
- Updated standards based on existing, cost-effective technology
  - Will institutionalize best practices already in place in some states and in use by several companies
- Technologies will allow US operators to save between U.S.$11 and $19 million per year even as they cut emissions of benzene and other air toxics, as well as volatile organic compounds – pollutants that form ground-level ozone (smog), which can cause asthma and adversely affect emphysema

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U.S. Oil and Gas New Source Performance Standards

- Rules will also yield co-benefits by reducing methane from natural gas wells. Methane is a potent greenhouse gas – more than 20 times as potent as carbon dioxide.
- Includes the first federal air standards for hydraulically fractured wells (i.e., well completions)
- Rules also set requirements for several types of equipment that may vent or leak VOCs or air toxics
  - Storage tanks
  - Reciprocating compressors
  - Centrifugal compressors
  - Pneumatic controllers
  - Glycol dehydrators
  - Leaks from valves at gas processing plants
  - Sweetening units at gas processing plants

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U.S. Oil and Gas New Source Performance Standards--Requirements

- Well completions:
  - Phased-in requirements for capturing natural gas; provides time for equipment to be manufactured and operators to be trained to capture gas through a process known as a “green completion”
  - Owners/operators of fractured and refractured wells may reduce pollution through flaring until Jan. 1, 2015; after that, gas capture is required
  - Wells that are refractured will not be considered affected facilities if they use green completions and meet recordkeeping/reporting requirements as of the effective date of the rule
  - Exploratory, delineation, and low-pressure wells are exempt from green completion requirements; will have to flare
  - Well completion notification and reporting requirements were streamlined to reduce burden to industry and states, while ensuring transparency and accountability

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U.S. Oil and Gas New Source Performance Standards--Requirements

- Storage tanks:
  - Phased-in requirements to reduce VOC emissions from new & modified tanks over one year, to ensure enough combustion devices are available to reduce the emissions
  - Requirement applies to both oil and natural gas production
  - Did not change air toxics standards for storage tanks; however, emissions storage tanks in natural gas production sector will be counted toward determining a major source under the air toxics standards for oil & natural gas production
- Reciprocating compressors:
  - Rule requires replacement of rod packing, which can leak VOCs as it wears
  - Rule provides an alternative schedule for rod packing replacement that does not require monitoring and documentation of operating hours
- Centrifugal compressors:
  - VOC reduction required for compressors with wet seal systems only; requirements do not apply in the natural gas transmission and storage segments, where VOC emissions generally are low

U.S. Oil and Gas New Source Performance Standards--Requirements

- Pneumatic controllers:
  - Used to regulate conditions such as pressure and temperature
  - Rule affects high-bleed controllers, allows use only for critical applications, such as emergency shutoff valves
  - Requirements apply to controllers used in both oil and gas sectors (in natural gas sector, applies only to sources upstream of the transmission line)
- Glycol dehydrators:
  - Covered under two air toxics standards (oil and natural gas production; natural gas processing plants)
  - Both standards retain existing standards for large dehydrators at major sources, set new standards for small dehydrators (not “area sources”)
- Leaks from valves at gas processing plants:
  - Strengthened requirements for detection and repair for VOCs and air toxics
- Sweetening units at gas processing plants:
  - Must reduce sulfur dioxide emissions by 99 percent

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U.S. Oil and Gas New Source Performance Standards

- Key Changes Since Proposal
  - Based on comments received during the public comment period, the final rule:
    - Includes an updated definition for a “reduced emissions completion”
    - Eliminates state permitting “trigger” when wells are refractured if operators choose to use green completions (instead of flaring)
    - Does not finalize requirements for compressors and pneumatic controllers in the transmission segment of this industry

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Global Methane Initiative

The Global Methane Initiative (GMI)

- The Global Methane Initiative is an international effort that advances cost-effective, near-term methane recovery and use as a clean energy source in five sectors:


Oil & Gas Systems


Coal Mines


Landfills


Agricultural Waste


Wastewater

- The goals of the Partnership are to reduce global methane emissions to:
  - Enhance economic growth
  - Strengthen energy security
  - Improve air quality and industrial safety
  - Reduce emissions of greenhouse gases

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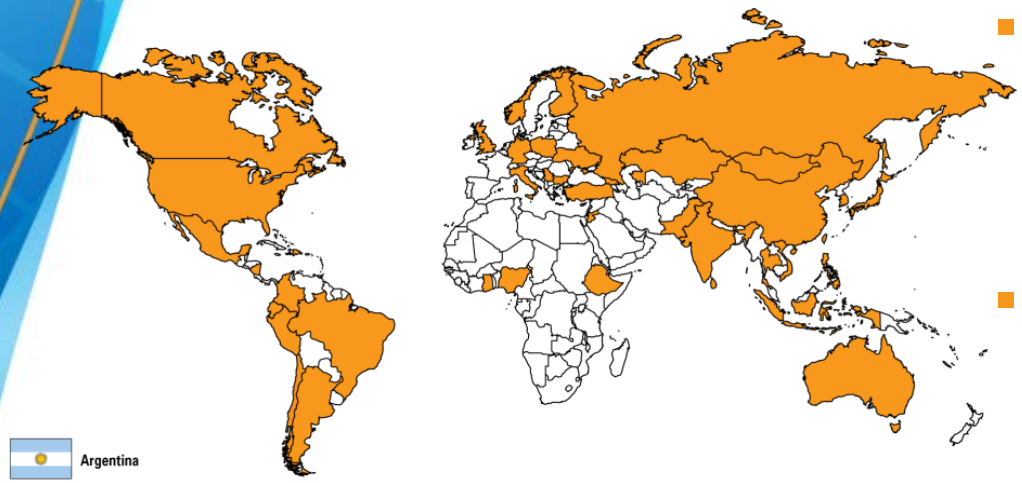
GMI Global Participation



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Nicaragua
Nigeria
Norway
Pakistan
Peru
Philippines
Poland
Republic of Korea (South Korea)
Russia
Serbia
Sri Lanka
Thailand
Turkey
Ukraine
United Kingdom
United States of America
Vietnam

- Membership:
  - 41 Partner governments
  - 1200+ public and private organizations
- Impact: Since 2004, GMI has facilitated project development at more than **600 sites** around the globe and reduced **151 million tCO_2e** of methane (Saved over **U.S.$1.1 Billion**)

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Global Methane Initiative

GMI and the Natural Gas STAR International Program

- Started in U.S. in 1993, expanded internationally in 2006
- Over 120 domestic and 14 international partners have
  - Identified over 50 cost effective technologies and practices to reduce methane emissions
  - Reduced methane emissions 27.8 billion m^3

Global Methane Initiative 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
  - Meetings
  - Study tours

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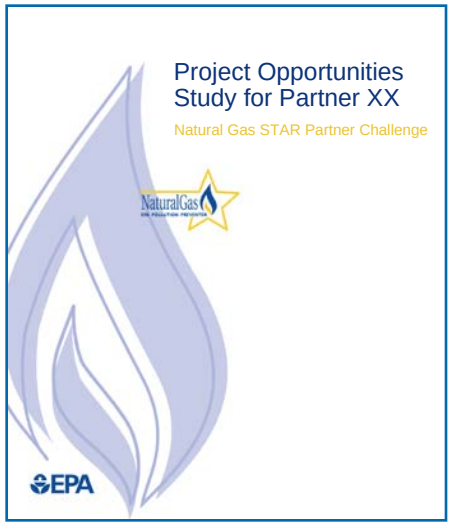
Global Methane Initiative Resources, cont.

- 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
- The following case studies provide examples of ways GMI has collaborated with international oil and gas companies to advance cost-effective methane emission reductions



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Case Study 1: Gazprom Replace Centrifugal Compressor Wet Seals with Dry Seals

Gazprom recognized the clear benefits of compressor dry gas seals. Throughout 2006-2008, Gazprom completed dry seal upgrades of 60 compressors and plan to continue these upgrades system wide.

- Other benefits of compressor dry seals include:
  - Elimination of combustible gas contamination by seal oil, which had resulted in pipeline discharge capacity reduction of 1-2 %.
  - Decrease in compressor's capacity losses by reducing friction in seals. Friction in wet seals causes substantial reductions in capacity of the compressor (10 times and more).
  - Increase in compressor seal operational life. Results in lower maintenance costs, higher overall reliability and less compressor downtime.
  - Improved energy efficiency. Wet systems require 50 to 100 kiloWatt/hour, while dry seal systems need about 5 kiloWatt of power per hour.

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Case Study 2: ONGC Technology Transfer

- GMI and ONGC conducted a series of successful technology transfer meetings at four sites to promote methane mitigation opportunities (December 2007)
- Based on the success of the meetings:
  - Conducted desktop prefeasibility analyses to estimate emissions sources at seven sites
  - GMI and ONGC conducted four onsite measurement studies to assess key methane emission sources and potential mitigation measures (May 2008)
  - Presented measurement study results and recommendations to ONGC Board of Directors (September 2008)

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Contact and Further Information

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epa.gov/airquality/oilandgas

New Source Performance Standards:
epa.gov/airquality/oilandgas

Global Methane Initiative:
globalmethane.org

Recommended Technologies:
epa.gov/gasstar/tools/recommended.html

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