Methane Management:
Voluntary International Initiatives in the Oil and Gas Sector

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Global Methane Initiative

Overview

- Oil and Gas International Voluntary Initiatives
  - Global Methane Initiative (GMI)
  - Climate & Clean Air Coalition (CCAC)
    - Oil and Gas Methane Partnership (OGMP)

- OGMP Technical Information
  - Nine major (core) sources
  - Technical Guidance Documents
  - Annual Site Surveys
  - Annual Reporting

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Global Methane Initiative (GMI)

- Launched in 2004, GMI is a voluntary, international public-private partnership that aims to reduce methane emissions and to advance the abatement, recovery, and use of methane as a clean energy source across 5 sectors, including oil and gas.
- Benefits:
  - Increased revenue through sales of recovered gas
  - Lowering capital replacement and O&M costs by installing state-of-the-art equipment
  - Improved air quality

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Structure and Organization

Steering Committee

Administrative Support Group (ASG)

Biogas Subcommittee

- Agriculture Technical Group
- Municipal Solid Waste Technical Group
- Wastewater Technical Group

Coal Mines Subcommittee

Oil & Gas Subcommittee

Proud Member Global Methane Initiative Project Network

Project Network

GMI Partner Countries

43 partner countries represent nearly 70% of total global manmade CH_4 emissions.

Argentina
Australia
Brazil
Bulgaria
Canada
Chile
China
Colombia
Dominican Republic
Ecuador
Ethiopia
European Commission
Finland
Georgia
Germany
Ghana
India
Indonesia
Italy
Japan
Jordan
Kazakhstan
Mexico
Mongolia
Nicaragua
Nigeria
Norway
Pakistan
Peru
Philippines
Poland
Republic of Albania
Republic of Korea (South Korea)
Russia
Saudi Arabia
Serbia
Sri Lanka
Thailand
Turkey
Ukraine
United Kingdom
United States of America
Vietnam

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GMI Strategies for Success

- ✓ Promote international cooperation on methane reduction
- ✓ Provide reliable methane emission data
- ✓ Support capacity building in partner countries
- ✓ Assist in the removal of barriers for methane project development
- ✓ Identify cost-effective opportunities for methane projects

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GMI Oil and Gas Subcommittee

- Key Activities:
  - Identification of applicable technologies and practices
  - Project feasibility studies
  - Methane emission inventories
  - Technical training or assistance

- Key Achievements since 2004:
  - Hosted meetings and workshops in nearly 20 countries
  - Completed country-specific action plans for 10 Partners
  - Showcased several project opportunities, success stories, and technology developments at GMI Expos and Partner events
  - Developed numerous technical resources and tools
  - Conducted methane measurement studies in Partner Countries

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Climate & Clean Air Coalition (CCAC)

CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

- Launched in 2012 to cost-effectively reduce short-lived climate pollutants (SLCPs), including methane
- 53 countries to date and 62 non-state partners (including World Bank, UNEP, WHO)
- Addresses SLCPs by:
  - Raising scientific understanding and awareness of impacts and mitigation strategies
  - Identifying and overcoming barriers, increasing capacity, and mobilizing support
  - Promoting best practices and showcasing successful efforts
- 11 sector-specific and cross-cutting initiatives, including Oil & Gas Initiative

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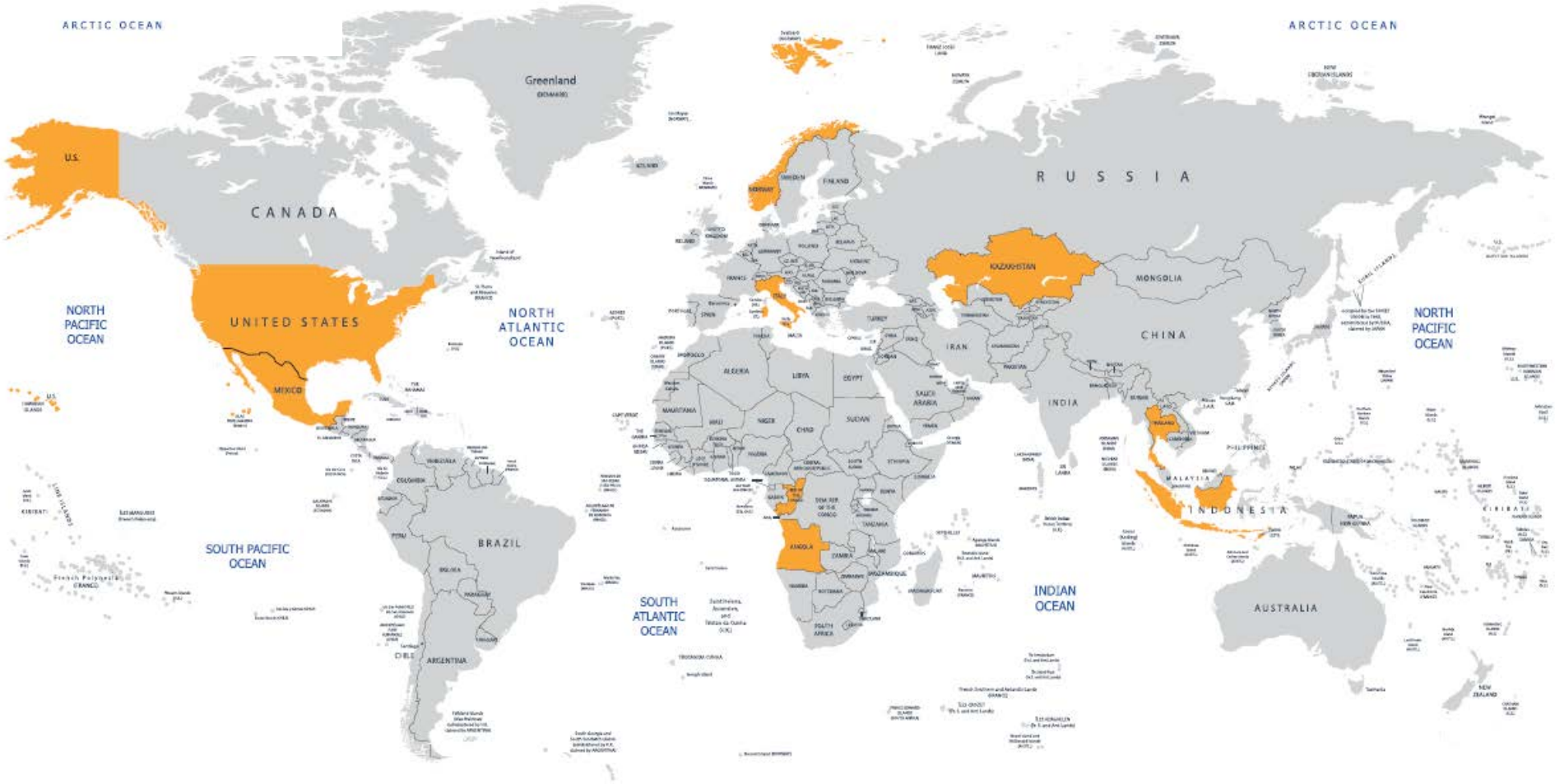
CCAC Oil & Gas Methane Partnership (OGMP)

- Launched at UN Climate Summit, September 2014
- Designed through collaboration and extensive stakeholder consultations with oil and gas companies, industry associations, NGOs, investor groups, and reporting initiatives
- Voluntary mechanism to help companies by:
  - Addressing emissions in a systematic manner
  - Providing a platform to showcase their results
  - Obtaining recognition of leadership

OGMP Reported Activities through 2016



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CCAC OGMP Commitments

- Partner companies agree to survey 9 major emission sources
- Report on the results of their surveys
- Report progress toward addressing excessive emissions

➢ Nine major (core) methane emission sources:

1) Natural gas-driven pneumatic controls & pumps
2) Fugitive equipment and process leaks
3) Centrifugal compressors with wet (oil) seals
4) Reciprocating compressor rod seal/packing vents
5) Glycol dehydrators
6) Unstabilized hydrocarbon liquid storage tanks
7) Well venting for liquids unloading
8) Well venting/flaring during completion of hydraulic fractured gas wells
9) Casinghead gas venting

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OGMP core source "best practice" controls

1. Natural gas-driven pneumatic controllers & pumps
   - Low/intermittent bleed controllers
   - Instrument air pneumatic gas
   - Compressed air/solar powered pumps
2. Fugitive equipment and process leaks
   - Directed Inspection & Maintenance Program
3. Centrifugal compressors with wet (oil) seals
   - Dry seals
   - Seal gas capture, recycle or flare
4. Reciprocating compressor rod seal/packing vents
   - Replace rod packing when economic, at least every 26,000 hours of operation
   - Capture, recycle or flare rod packing vent

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OGMP core source "best practice" controls (continued)

5. Glycol dehydrators
   - Flash tank separator with gas routed to use or flare
   - All vents routed to vapor recovery or flare
6. Unstabilized hydrocarbon liquid storage tanks
   - Vapor recovery
   - Stabilize oil ahead of tanks
   - Route tank vapor to flare or other combustion device
7. Well venting for liquids unloading
   - Optimize unloading to minimize atmospheric venting
   - Foaming agents/velocity tubing to minimize atmospheric venting
   - Plunger lifts
   - Downhole pumps
   - Gas lift

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OGMP core source "best practice" controls (continued)

8. Well venting/flaring during completion of hydraulic fractured gas wells
   - Implementation of reduced (green) completion gas capture to sales line or flare

9. Casinghead gas venting
   - Wellhead compressor or vapor recovery unit
   - Route to tank with vapor recovery
   - Route to flare or other combustion device

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OGMP Technical Resources

- Description of source technologies with unmitigated methane emissions
- Description of best practices to mitigate methane emissions
- Emissions quantification methodologies
- Example costs and economics for implementing best practices

http://ccacoalition.org/en/content/oil-and-gas-methane-partnership-technical-guidance-documents

OGMP Annual Activities

- Site Survey
  - Were the core sources found in the facility?
  - If so, how many?
  - Of those found, how many are “mitigated” and “un-mitigated”?
  - How many un-mitigated sources were/will be controlled under the OGMP program?
- Annual Report
  - Results of site surveys
  - Methane emission reductions achieved under the OGMP program

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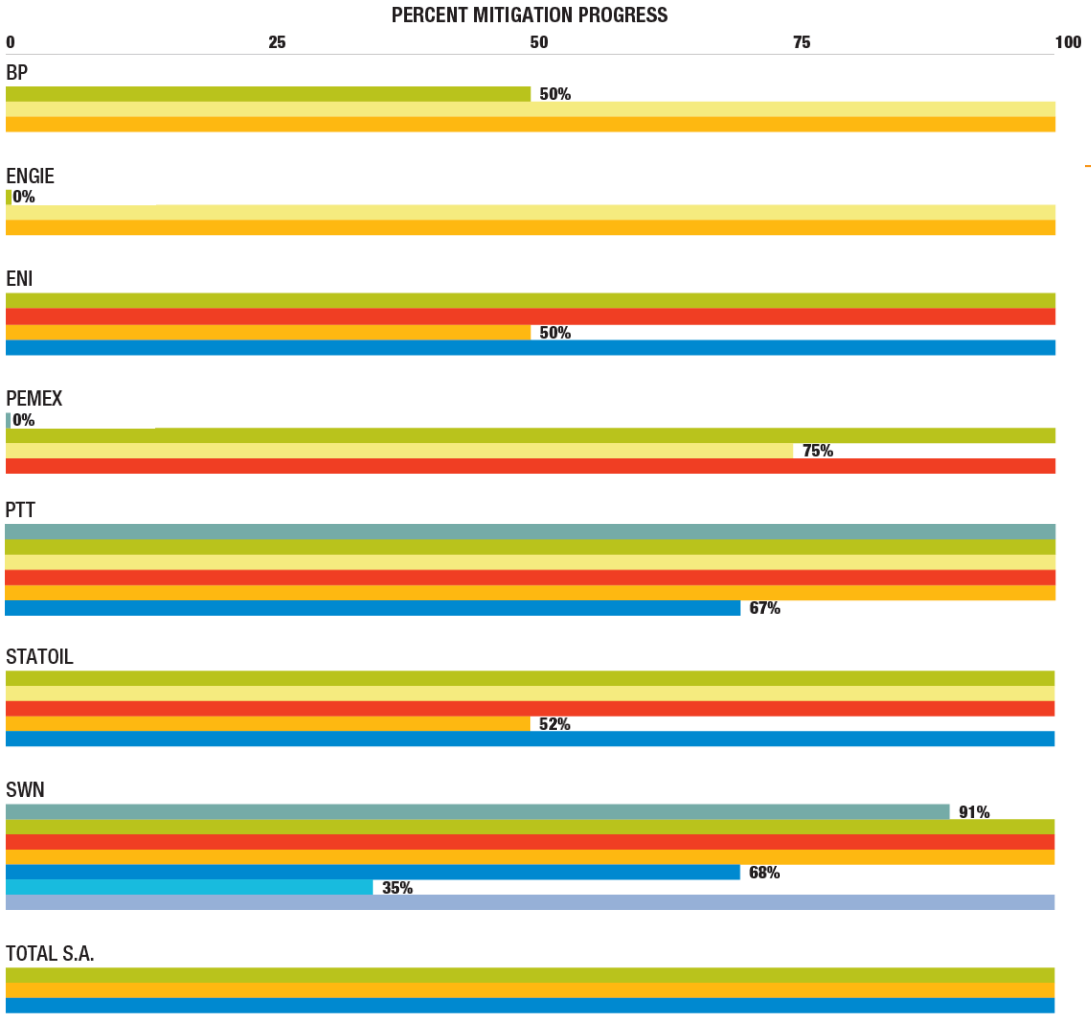
OGMP 2016 Annual Reported Mitigation Progress

Figure 2. Mitigation progress (percent) for core sources present at participating assets surveyed so far by company.



Length of each bar indicates the percentage of potential methane sources of a particular type identified during surveys that could be considered mitigated. Lack of a bar for a particular source type indicates non-presence of that source type at assets surveyed so far by the company.

- = Natural gas-driven pneumatic controls and pumps
- = Fugitive component and equipment leaks
- = Centrifugal compressors with "wet" (oil) seals
- = Reciprocating compressors rod seal/packing vents
- = Glycol dehydrators
- = Unstablized hydrocarbon liquid storage tanks
- = Well venting for liquids unloading
- = Well venting/flaring during well completion for hydraulically fractured wells
- = Casing head gas venting

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OGMP PEMEX Experience

- PEMEX found one, uncontrolled wet seal centrifugal compressor
- Working with the Fluid Sealing Association, they employed the Life-cycle Cost Calculator[1] to evaluate the economics of different control options
- Currently evaluating the results and feasibility of retrofitting control technology

1. http://FSAKnowledgeBase.org/CompressorLCC.php

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2018 Global Methane Forum

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For More Information

- GMI maintains an extensive website at: www.globalmethane.org
- Climate and Clean Air Coalition's Oil & Gas Methane Partnership:

  http://www.ccacoalition.org/en/content/ccac-oil-gas-methane-partnership

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