Coal Mine Methane Activities and the US Climate Action Plan Strategy to Reduce Methane Emissions

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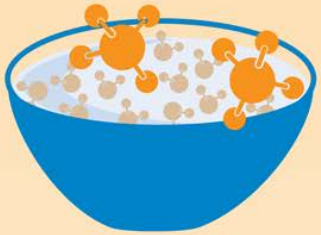
Methane Matters...

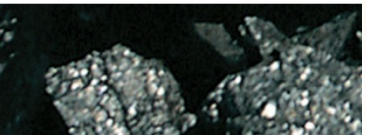
Short-lived climate pollutant, with atmospheric lifespan of **12 years**



Most prevalent manmade greenhouse gas after CO_2

Traps **28 times** more heat in the atmosphere than CO_2[1]

Accounts for **32%** of climate forcing



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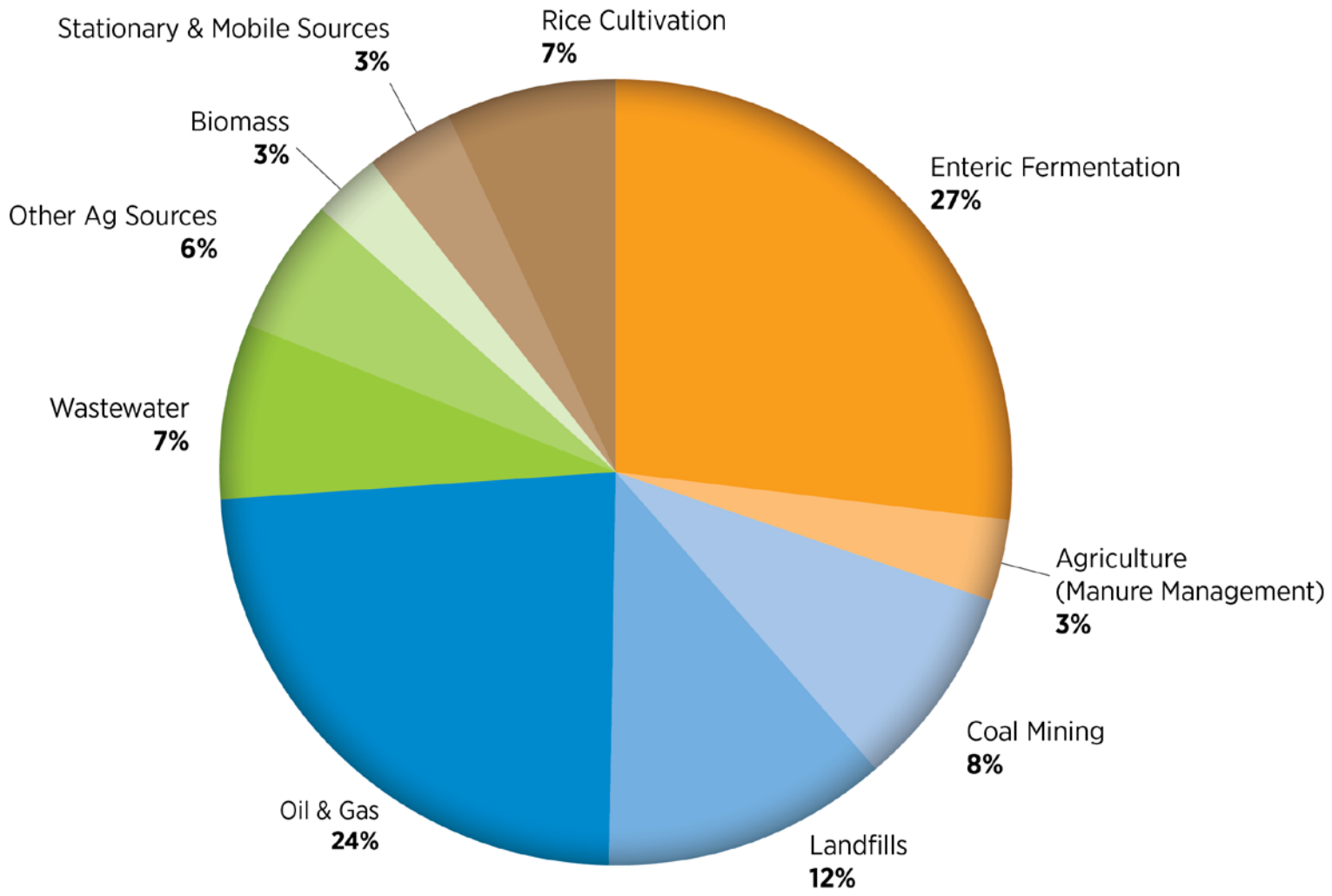
Estimated Global Anthropogenic Methane Emissions by Source, 2015



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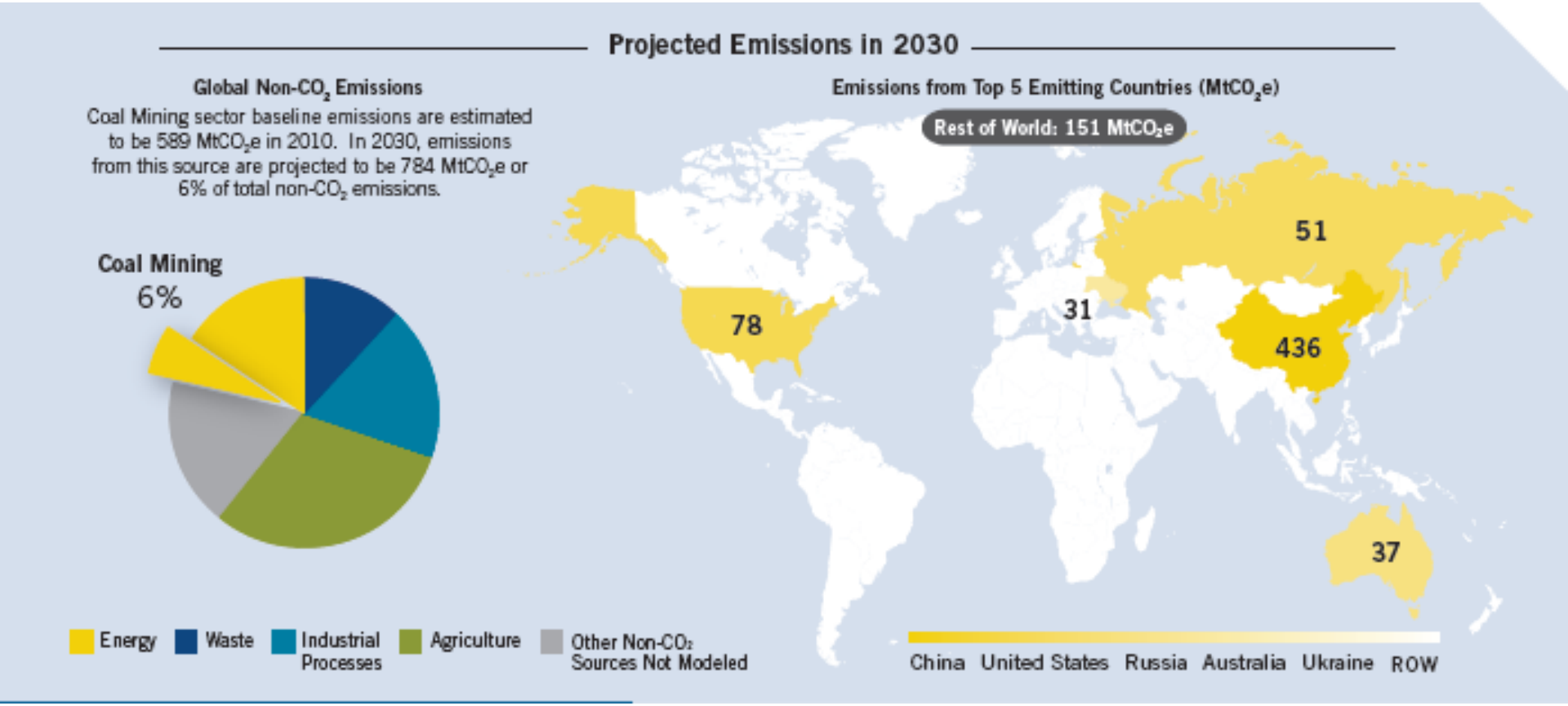
Global CMM Emissions Projection



U.S. EPA. Global Mitigation of Non-CO2 Greenhouse Gases: 2010 – 2030 EXECUTIVE SUMMARY. April 2014, EPA Report 430S14001. http://epa.gov/climatechange/EPAactivities/economics/nonco2mitigation.html

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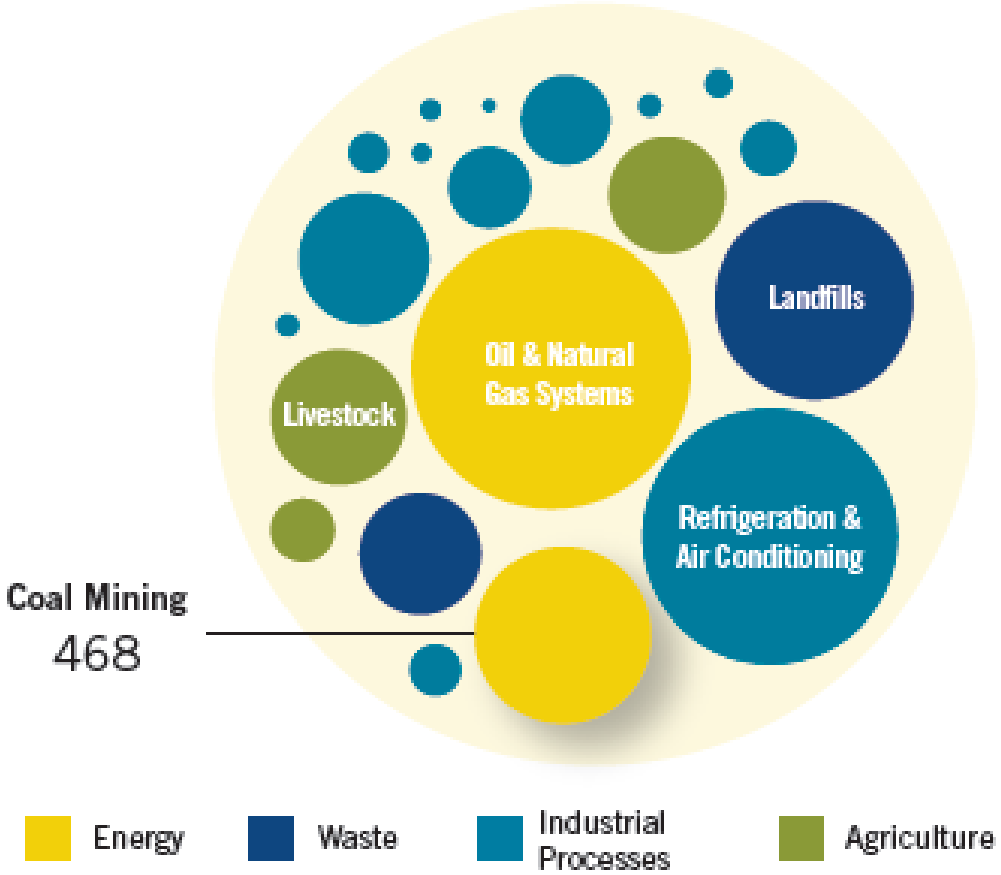
Global CMM Emissions Reduction Potential

Emissions Reduction Potential

Assuming full implementation of current technology, emissions in the coal mining sector could be reduced by up to 468 $MtCO_2e$ in 2030. This accounts for 10% of the 4,615 $MtCO_2e$ in global reduction potential in 2030.



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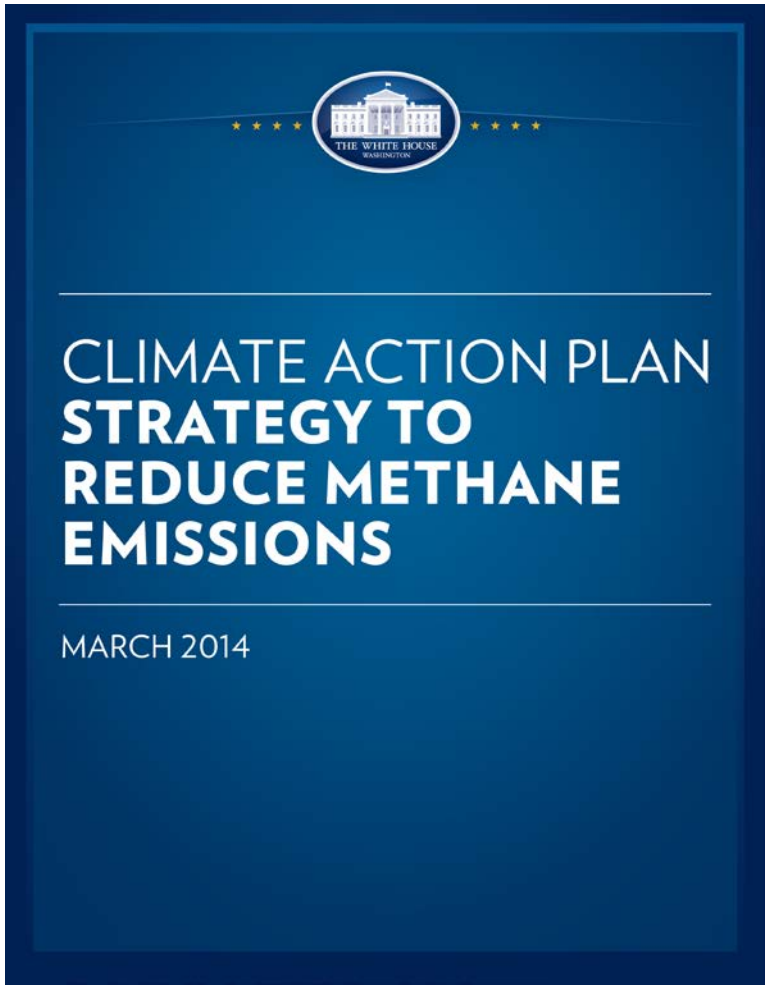
The U.S. Interagency Methane Strategy

- In June 2013, President Obama issued Climate Action Plan that included:
  1) **Steps to cut greenhouse gas pollution**
  2) **Steps to prepare US for impacts of climate change**
  3) **Continue US leadership in international efforts to combat climate change**

- Under Step 1: Interagency Methane Strategy
  - EPA, USDA, DOE, DOI, DOT were directed to develop a comprehensive methane strategy (March 28, 2014)
  - Takes into account data on where methane pollution is coming from
  - Builds upon best practices and activities under way to tackle methane waste



Overview

- The plan focuses on four sectors:
  - **Landfills (EPA)**
  - **Agriculture (EPA, USDA, DOE)**
  - **Coal Mines (DOI, EPA)**
  - **Oil & Gas (EPA, DOE, DOI)**

- **Reducing Methane Emissions:** Builds on best practices and activities to reduce methane emissions
  - Combination of regulatory and voluntary domestic activities, depending on sector
  - Call for continued international data collection through GMI, nonCO2 mitigation report

- **Improving Methane Data:** Also calls for assessment of current methane emissions data
  - Identifies ways in which EPA can improve the GHG inventory and GHGRP
  - Focusses on improving global estimates

Improving Methane Data and Measurements

- Identifies key actions to improve methane emissions data for all sectors, particularly oil and gas

- Enhancing the GHG Inventory and GHGRP
  - EPA will continue to update and enhance the annual GHG Inventory as new data and information emerges and make ongoing improvements to the GHGRP regulatory requirements

- Improving Global Emissions Monitoring and Estimates
  - EPA will continue to collect emission reduction data through GMI and will continue to update and publish detailed emissions estimates through the Global Mitigation of Non-CO2 GHGs and Global Anthropogenic Non-CO_2 GHG Emissions
  - Also highlights NOAA, DOE, and NASA activities

- Other Activities:
  - Building our National Methane Monitoring Network (NOAA)
  - Encouraging the Development of Cost-Effective Measurement Technologies (DOE's ARPA-E) program new methane fund to develop methane sensing

U.S. Leadership in Reducing Global Methane Emissions

- Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (SLCPs) – HFCs, methane, black carbon
  - Now has nearly 40 country partners plus many non-state actors (e.g., World Bank, UN Environment Program) and over $45 million in donor country pledges
  - Tackling methane through sector-specific initiatives such as Municipal Solid Waste, Oil & Gas, Agriculture

- Global Methane Initiative – voluntary public private partnership
  - 43 Partner countries, over 1200 private sector participants
  - Five sectors: agriculture, oil & gas, MSW, coal mining, wastewater
  - On the ground, best practices implementation, country-level action plans
  - US chairs steering committee

- Arctic Council Task Force on Black Carbon and Methane
  - US is working with other Arctic countries (Canada, Russia, Norway, Finland, Sweden, Denmark) to address / work to achieve enhanced emissions reductions in the Arctic

EPA's Coalbed Methane Outreach Program

- **Our Mission**
  - To work with the private sector to cost-effectively reduce C emissions through recovery and use projects

- **Our Focus**
  - Greenhouse gas emission reduction opportunities: ***coal mine methane (CMM)*** rather than coalbed methane (CBM)
- **Our Activities**
  - Identify profitable opportunities for CMM recovery
  - Identify and help overcome market, regulatory, technical barriers
  - Offer technical and analytic support where appropriate
  - Conduct direct outreach to coal mines
- **Our Accomplishments**
  - The US CMM industry is robust. Over 84% of methane from US coal mine degasification systems is recovered and used today, compared to ~25% in 1993.

Benefits of Coal Mine Methane Utilization

Methane is a potent greenhouse gas and the primary component of natural gas. The benefits of utilizing coal mine methane (CMM) include:

- A new source of clean, local energy
- Improved air quality and mine safety
- An additional revenue stream for the coal mine
- Increased mine productivity
- Reduced greenhouse gas emissions

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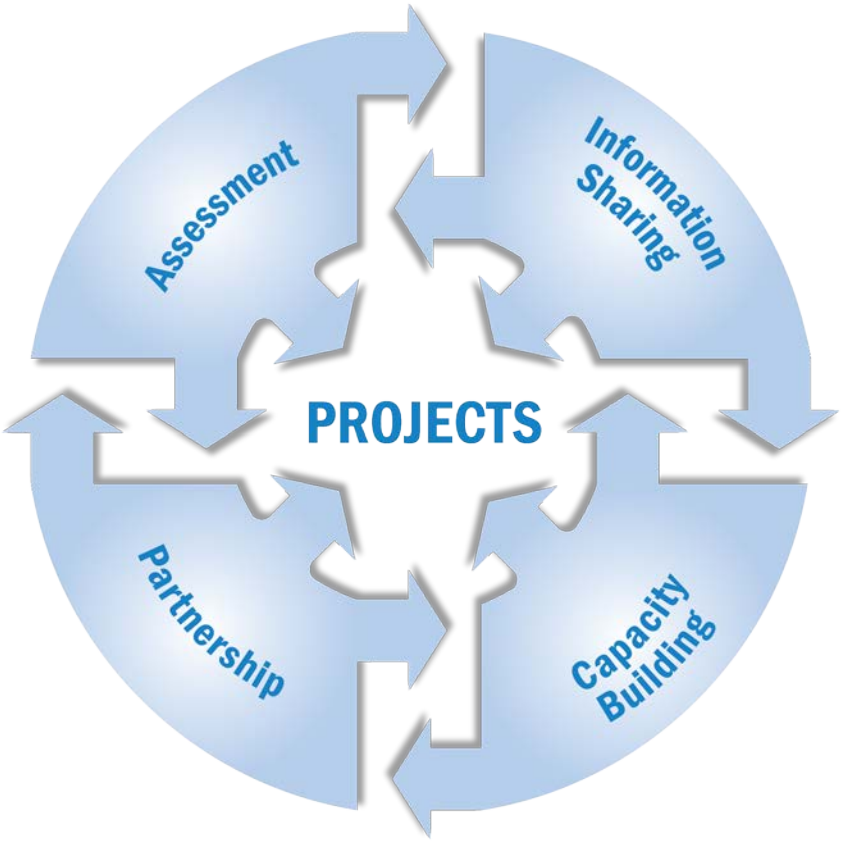
CMOP Project Development Cycle



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United States Coal Sector Update

U.S. Coal Sector Trends

- Coal production decreased from 921 MMt in 2012 to 891 MMt in 2013 (-3%)
- Number of underground mines dropped from 488 in 2012 to 395 in 2013 (-19%)
- Number of surface mines dropped from 719 in 2012 to 637 in 2013 (-11%)
- CMM emissions decreased slightly from 2012-2013
- Greenhouse Gas Reporting Program
  - Directed by Congress in 2008 Appropriations Act
  - Reporting only, no control or use requirements
  - Data is available at http://www.epa.gov/ghgreporting/reporters/subpart/ff

United States Coal Sector Update

➢ U.S. Coal Sector Trends

o 2013 trends in the energy sector

- Slight increase in natural gas consumption (+2%)
- Natural gas prices continue to rebound (+30%)
- Coal consumption up modestly (+4%) following 2012 decrease (-15%)
- Coal prices decreased slightly (-1%)

o Implementation of national plans/directives

- June 2013, President Obama issued Climate Action Plan that included:
  - Steps to cut greenhouse gas pollution
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o Regulatory update

- April 2014, BLM issued Advanced Notice of Public Rulemaking for Waste Mine Methane Capture

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CMM Project Outlook

- **Challenges to emission reduction projects in the United States:**
  - A lack of infrastructure (e.g., pipelines) in certain regions of the country (i.e. particularly in the west) to move CMM from mines to natural gas markets.
  - Low electricity prices in all major coal mining states, and low gas prices in mountain west make CMM energy projects unattractive from an economic perspective.
- **Approaches to overcoming challenges**
  - Voluntary and compliance carbon markets
  - State alternative energy and renewable energy programs
  - State capital investment, loans, and tax benefits and credits
  - Support for technology demonstration projects

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Exciting CMM Developments

- **New incentives supporting CMM projects**
  - July 2013: State of Colorado included CMM as a renewable energy source in the state's renewable portfolio standard (RPS) to meet its 2020 goals
    - 3 MW CMM Power Plant eligible for Colorado RECs
  - July 2014: New project opportunities presented by California Air Resources Board inclusion of CMM as compliance offset source (Mine Methane Capture protocol)
    - Early action projects from CAR and VCS can qualify
    - \$8-\$9/tCO_2e price may spur new VAM project activity
    - Increased activity for AMM projects

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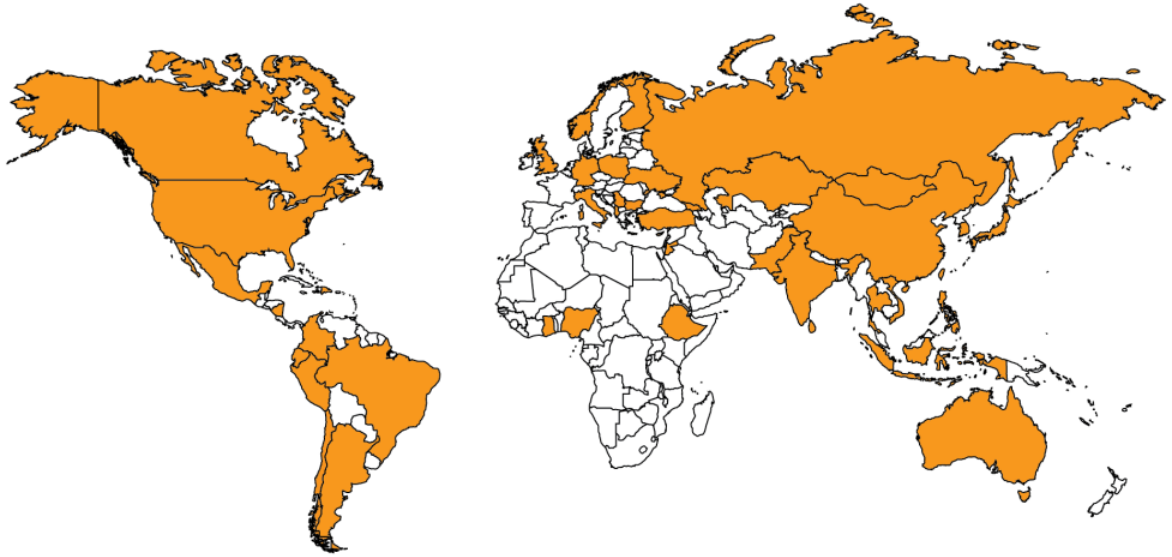
GMI Partners

- Grown from 14 to 42 countries, plus European Commission
- Represent nearly 70% global anthropogenic methane emissions



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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
Serbia
Sri Lanka
Thailand
Turkey
Ukraine
United Kingdom
United States of America
Vietnam

U.S. Strategy for International CMM Reductions

- **Priorities:**
  - Reduce GHG emissions
  - Promote use of clean energy source
  - Achieve profitable recovery of CMM
- **Activities to Promote Methane Mitigation and Abatement**
  - Between 1994 and 2012, U.S. CMM emissions reductions have effectively removed the equivalent of more than 326 MMtCO2e from the atmosphere
  - U.S. identifies, evaluates and promotes CMM recovery and use opportunities; provides support for technology demonstration projects; and develops technical documents, tools and resources
  - International activities under the auspices of GMI
    - CMM/CBM Clearinghouses; pre-feasibility and feasibility studies
    - UNECE *Best Practice Guidance for Effective Methane Drainage and Use in Coal Mines*, technical seminars
    - Technical resources; tools; policy white papers
    - CMM Finance Guide and CMM Financial Model: updates in progress; will assist with international CMM project development

Updated online at https://www.globalmethane.org/coal-mines/index.aspx

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For more information, please contact:

USEPA Coalbed Methane Outreach Program

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