Strategic Role of CMM in Climate Change Mitigation; US Policies Affecting CMM Capture and Use

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Workshop: Coal Mine Methane as a Valuable Energy Resource

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Current and future state of the coal industry

- Currently meets 27% of global primary energy demand\(^1\)
- Coal demand rebounded in 2017 following decline after 2014.\(^1\)
- In 2040, assuming nationally determined contributions (NDC) in place, coal still meets 22% of primary energy demand\(^2\)
- Recent trends indicate that coal demand could be more resilient than expected, especially in developing economies in Asia.\(^1\)
- Coal producers are moving to deeper and more complex seams
- Continuing efficiency improvements in the industry

\(^1\) IEA (2019). World Energy Outlook 2018
\(^2\) IEA (2018). World Energy Balances 2018
Methane emissions and the coal industry

- CH₄ emissions are a growing concern¹
  - CH₄ ~16% of global GHG emissions
  - Global Warming Potential of CH₄ is 28-34 times greater than CO₂ (AR5)
- Coal production 4th (9%) among sources of anthropogenic methane emissions²
- CMM emissions in 2030 projected to be 933 MtCO₂e³
- Mines closing in many countries, but emissions CH₄ not declining at the same rate

U.S. Example: 2008 - 2016⁴

Number of Operating Underground Mines
- 57%

CH₄ Liberated from Underground Mines
- 23%

¹ IPCC, 5th Assessment Report (AR5)
² Global Methane Initiative. Infographic
What is the strategic role for CMM capture and use in global climate change mitigation?

- Recognition of coal’s role in energy demand
- Reduces carbon footprint of coal industry
- Scale to emission reductions
- Available and proven technology for methane recovery
- Limited emission pathways
- Prioritizes methane sources in global mitigation efforts
Over 200 CMM/VAM projects operational around the world

http://projects.erg.com/cmm/
Scale of GHG emission reductions on a facility-basis favors CMM

GHG Liberation by Sector – U.S.

- Coal Mines
- Oil and Gas Onshore Production
- Municipal Landfills

GHG Emissions per Facility – U.S.

- Coal Mines
- Oil and Gas Onshore Production
- Municipal Landfills

Source: U.S GHGRP 2018
CMM projects offer scale comparable to commercial Carbon Capture & Storage (CCS)

- **Petra Nova Carbon Sequestration Project**
  - 240 MW Coal-fire Power Plant
  - Houston, TX USA
  - GHG Reduction Potential (RP) = 1.8 million tCO₂e/yr

- **Gaohe VAM Power Project**
  - 30 MW power plant & 12 oxidizers
  - Shanxi Province, China
  - GHG RP = 1.3 million tCO₂e/yr

- **Verdeo McElroy VAM Power Project**
  - 3 oxidizers to produce 3MW in power generation
  - Glen Easton, WV, USA
  - GHG RP = 0.3 million tCO₂e/yr

- **No. 4 and No. 7 Mine Natural Gas Pipeline Project**
  - Drained gas directly fed to pipeline
  - Brookwood, AL, USA
  - GHG RP = 3.3 million tCO₂e/yr

- **Duerping Mine CMM Power Project**
  - 12 MW with flare
  - Shanxi Province, China
  - GHG Reduction Potential (RP) = 0.5 million tCO₂e/yr
CMM policy and regulations in the United States

National level

U.S. Department of Labor
Min Safety & Health Administration

Environmental Protection Agency

U.S. Department of the Interior

State level

California Air Resources Board

Global Methane Initiative
Federal policy drivers in the U.S.

**U.S. Mine Safety & Health Administration (MSHA)**
- CMM/VAM capture and use require MSHA authorization
- No formal mandate to promote CMM/VAM use
- Have approved power generation, natural gas pipeline sales, shaft heating, flaring, coal drying and VAM oxidation

**U.S. Environmental Protection Agency (EPA)**
- U.S. and international voluntary programs to promote CMM recovery and use for environmental and public safety & health benefits
- International work is coordinated through GMI and with the UNECE Group of Experts on CMM
- Manages the Greenhouse Gas Reporting Program (GHGRP) - a U.S. regulatory reporting program for 41 economic sectors including gassy underground coal mines
Federal policy drivers in the U.S.

Other federal agencies

U.S. Bureau of Land Management (BLM)
- Manages lands owned by the Federal Government including mineral rights
- Considers CMM emissions in granting mining concessions
- In 2014, released an “advanced” notice of proposed regulatory action to address CMM emissions on federal lands, but a formal rulemaking was never finalized.

U.S. Forest Service
U.S. Fish and Wildlife Service
U.S. carbon markets

2 Options for U.S. CMM Projects

California Cap-and-Trade
- Regulated
- Must list project on registries
- California Compliant Offset (CCO)
- Price: $13-14/tCO₂
- Verification of emission reductions
  - required by law
  - using approved 3rd party verifier
- Offsets
  - CMM projects anywhere in U.S.
  - 4% of allowance budget after 2020
  - After 2020, only 50% out of state

Voluntary Markets
- Unregulated
- May list project on registries
- Commodity: VER, CRT
- Price: $1-5/tCO₂
- Verification of emission reductions
  - by contract or registry rules
  - registry - approved 3rd party verifier
- Offsets
  - CMM projects anywhere in U.S.
  - No limit on # of offsets
  - No restrictions on location of projects
Challenges facing CMM mitigation

- Industries are facing economic headwinds
- Further R&D and wider deployment are necessary
- Economic benefits may be small
- Vertically integrated firms must align objectives of all levels
- Limited economic incentives
- Technical expertise may not be available
- Regulations may not be affecting emission reduction efforts\(^1\)
  - China’s lack of methane reductions following regulation

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