# Status and Trends in CMM Development: China, USA and Eastern Europe

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# Outline

- Overview of CMM Projects Worldwide
- China, United States, Ukraine, Poland, and Czech Republic
  - CMM Projects
  - Regulatory Context
  - Environmental and Safety Regulations
  - Carbon Trading Schemes
- Conclusions

# Overview of CMM Projects

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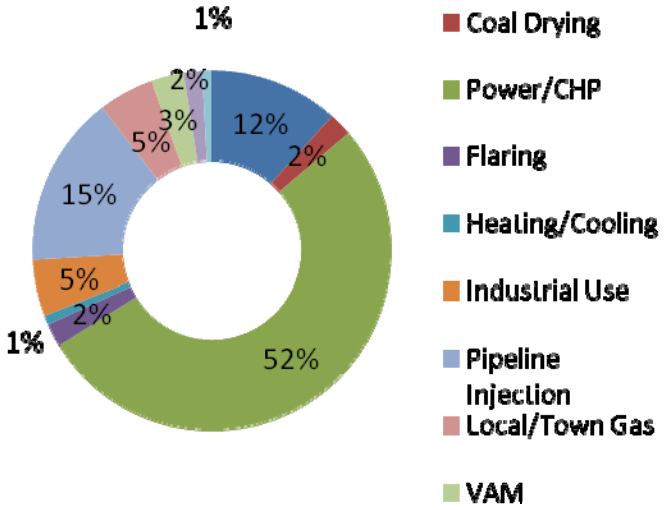
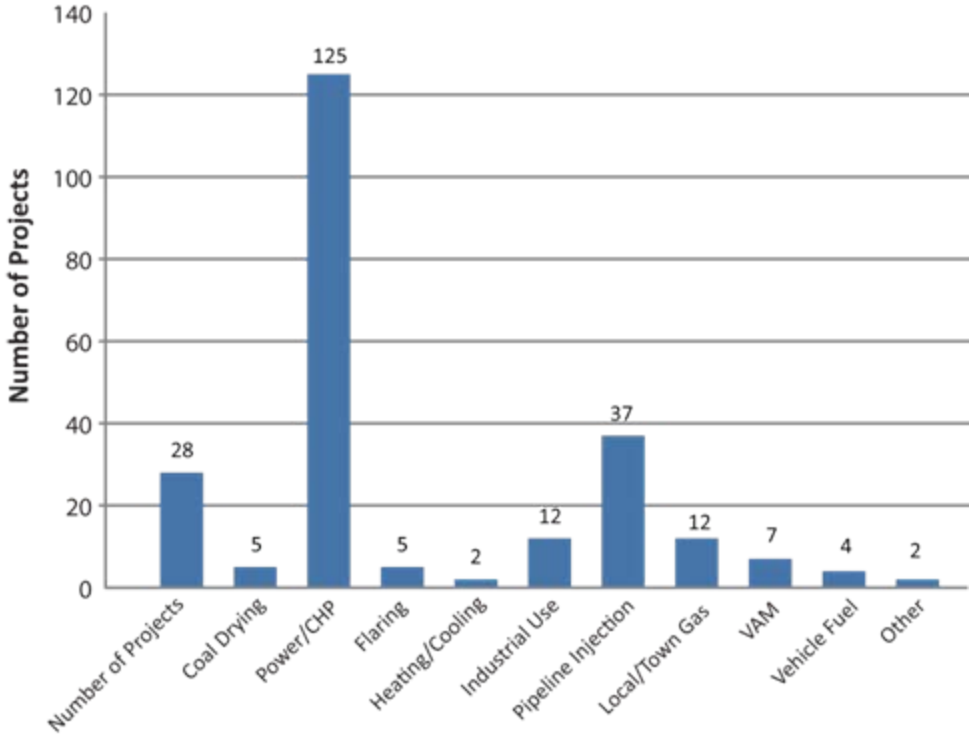
# Overview of CMM Projects

| Country | Projects at Active Mines | Projects at Abandoned Mines | Project Types | Emissions Avoided (Mmt CO2e) |
|---|---|---|---|---|
| China | 41 | 0 | Town gas (11), power generation (19), industrial application (4), vehicle fuel (3), pipeline injection (1), boiler fuel (2), VAM (1) | 8.6 (2004) |
| United States | 13 | 26 | Heating/cooling (2), pipeline injection (33), power generation (2), coal drying (1), other (2) | 20* (2006) |
| Poland | 21 | 0 | Power generation (1), coal drying (4), CHP (5), industrial use (3), boiler fuel (8) | 2.1 (2007) |
| Ukraine | 9 | 0 | Power generation (2), CHP (2), industrial use (1), boiler fuel (4) | 1.9 (2001) |
| Czech Republic | 1 | 0 | Pipeline injection | 1.4 (Annual estimate) |

Sources: USEPA (2009): Global Overview of CMM Opportunities, US Environmental Protection Agency, Coalbed Methane Outreach Program, January 2009, http://www.methanetomarkets.org/m2m2009/tools-resources/coal_overview.aspx.
Franklin (2009): Overview of Global Opportunities for Coal Mine Methane Project Development, Dr. Pamela Franklin, Coalbed Methane Outreach Program, presented September 2-3, 2009 at CMM Workshop Ulaanbaatar, Mongolia.

# Overview of CMM Projects (2)




The figures above summarize the distribution of known CMM projects globally that are operating, under development, or are planned.

These figures are based on a the Methane to Markets database which includes more than 240 CMM projects worldwide.

# China Perspective

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# China CMM Projects

- Over 200 mines have drainage systems (2004)
- 41 CMM projects currently operating at active mines: total 240 million cubic meters/yr
  - Power generation: > 100 MW total installed capacity
  - Town gas (heating / fuel): > 500,000 households
  - Boiler fuel
  - Industrial applications
  - Vehicle fuel
- Many more CMM projects planned, under development
  - Power generation: > 220 MW additional capacity
  - Town gas: 46,000 more households
  - LNG: several under discussion and planning
- Challenges to CMM development:
  - Most mines are not accessible to gas pipeline network
  - Limited drainage technologies/low drainage rates
  - Regulations for foreign project developers may be unclear

# China's Regulatory Context

- Recovery and utilization of CMM can only be exercised by coal enterprises with legal mining licenses and require approval from the National Development and Reform Commission (NDRC) at each level.
- Tax benefits for coal enterprises conducting CMM recovery and utilization - preferential state policies on:
  - Resources tax
  - Value added tax (VAT)
  - Tariff tax
  - Income tax of enterprises

CMM equipment exempt from import tariffs and VAT

# China's Regulatory Context (2)

- Exploration and development rights have been modified to be more inclusive
  - China United Coalbed Methane Corporation (CUCBMC) no longer has monopoly rights to work with foreign companies in CMM development
  - State Council widened rights to "other companies designated by the State Council" to join with foreign businesses in developing CMM and CBM resources
- Price structure for natural gas favors use of CMM, but not investment
  - CMM price for civil and industrial consumption set far lower than natural gas
- Subsidies also encourage CMM use
  - In April 2007, the Ministry of Finance provided a subsidy of 0.2 Yuan/$m^3$ (US$ 0.03/$m^3$) for CMM exploitation enterprises
  - Local finance departments are allowed discretion to increase their own subsidies based on this standard

# China's Regulatory Context (3)

- Effective January 1, 2005, State Administration of Work Safety (SAWS) and State Administration of Coal Mine Safety (SACMS) released a Coal Mine Safety Regulation relevant to the CDM.
- Section 148 requires that in order for CMM projects to be registered as CDM projects, they must make use of gas concentrations not lower than 30 percent methane.
- Recent standards were passed in December 2009 that establish guidance on use of low quality methane (concentration of methane is within explosive limits), will be implemented in July 2010.

# China's Environmental and Safety Regulations

- Regulations for projects include:
  - Waste water drainage
  - Atmospheric pollution
  - Noise pollution
- Energy use during the projects should be in accordance with the "Energy Conservation Law of the People's Republic of China" and the energy-saving regulations and measures of the state and local governments.
- The State Administration of Work Safety (SAWS) monitors worker safety in China. Laws and regulations such as the "Coal Mine Safety Regulation" should be followed when developing CMM exploitation and utilization projects.

# Carbon in China

- Clean Development Mechanism (CDM)
- Voluntary schemes
  - Tianjin Climate Exchange (TCX)
  - China-Beijing Environmental Exchange (CBEEX)
  - Others have been discussed

# United States Perspective

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# United States CMM Projects

- 50 Bcf of CMM recovered and utilized (2006)
  - Equals 1.4 Bcm or 20 MMTCO2e
  - Active Underground Mines: 46.2 bcf (1.3 Bcm)
  - Abandoned Mines: 3.4 bcf (0.1 Bcm)
  - VAM reductions underway at JWR in Alabama
- Current US CMM Projects
  - 13 active underground coal mines
  - 26 abandoned underground mines
  - Methane is used for:
    - pipeline injection: 33 projects
    - coal drying: 1 project
    - heating/cooling: 2 projects
    - power generation: 2 projects
    - other uses: 2 projects

# The United States' Regulatory Context

- Biggest regulatory issue for CMM in U.S. is ownership
  - Ownership of carbon-based mineral rights is often divided between oil/natural gas and coal
- Mineral leases are either owned by
  - U.S. government, as is the case in many parts of the West,
    - Federal law governs U.S. government leases, and the Bureau of Land Management in the Department of Interior manages the mineral rights on those properties
  - Private entities, as is the case in the other areas of the country and in parts of the West.
    - For private leases, laws in each individual state govern ownership of the resource.

# The United States' Regulatory Context (2)

- Tax credits
  - Section 29 credits expired in 2002
  - Encouraged production of unconventional sources of natural gas including CBM and CMM
  - Reauthorization of Section 29 (now Section 45) credits was removed before the Energy Independence and Security Act of 2007 was passed in the 110th Congress
- Royalties
  - Negotiable for private leases
  - Standard royalty of 12.5% of revenues on sales is paid by operator/lessee to the owner of the mineral estate
  - Severance taxes paid to state governments
  - Power sales also taxed
- Tariffs for gas exports/imports to or from Mexico and Canada have been removed by the North American Free Trade Agreement

# The United States' Environmental and Safety Regulations

- Environmental regulations relevant to CMM projects
  - Pollution control measures
    1) Air quality – NOx, SOx, particulates
    2) Water quality – limiting stormwater and wastewater discharge
    3) Noise abatement
  - Habitat/land-use
    - Compliance with Endangered Species Act
    - Habitat protection including roadless areas
    - Environmental Impact Statements may be required on federal lands

# The United States' Environmental and Safety Regulations (2)

- Safety Regulations
  - Mine Safety Health Administration
    - Operation of any in-mine drilling and gas gathering equipment
    - Most surface equipment
  - Occupational Safety and Health Administration
    - Worker health
    - Equipment unrelated to mining operation (gas engines away from mine facilities)

# The United States' Environmental and Safety Regulations (3)

- Mandatory GHG Reporting Rule
  - First Federal rule requiring mandatory reporting of GHG emissions from large sources (meet emissions threshold of 25,000 metric tons or more of CO2e/year)
  - Underground coal mines, coal suppliers delayed as source categories as EPA considers comments and options
  - Reporting begins in 2010

# The United States' Environmental and Safety Regulations (4)

- Endangerment Finding
  - April 2, 2007, in *Massachusetts v. EPA*, 549 U.S. 497 (2007), the Supreme Court found that greenhouse gases are air pollutants covered by the Clean Air Act
  - April 17, 2009, EPA's Administrator signed proposed endangerment and cause or contribute findings for greenhouse gases under Section 202(a) of the Clean Air Act
  - These findings were signed by the Administrator on December 7, 2009. On December 15, 2009, the final findings were published in the *Federal Register.*
  - Final rule effective January 14, 2010.
  - Immediately challenged by Sen. John Barrasso (R-WY.), Sen. David Vitter (R-LA), Rep. Darrell Issa (R-CA) and Rep. James Sensenbrenner Jr. (R-WI) via letter to EPA Administrator Lisa Jackson
    - Cite violation of the Data Quality Act (DQA)
  - Sen. Lisa Murkowski (R-Alaska) wants to overturn the endangerment finding using the Congressional Review Act, enacted in 1996, which allows Congress to block federal agency rules

# Carbon in the U.S.

- Voluntary Schemes
  - Climate Action Reserve
  - Greenhouse Gas Services
  - Chicago Climate Exchange
  - Voluntary Carbon Standard
- Cap and Trade Legislation
  - Waxman Markey passed House in June 2009
  - Senate approaches
    - Cantwell/Collins
    - Kerry/Lieberman/Graham
- Copenhagen Accord
  - U.S, China, India, Brazil and South Africa

# Ukraine Perspective

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# Ukraine CMM Projects

- The Methane to Markets CMM Projects Database currently identifies nine CMM recovery projects in Ukraine
- Eight projects at active, underground mines in the Donbass
- One project operating in the Lugansk basin
- Methane is used for
  - boiler fuel: 4 projects
  - combined heat and power: 2 projects
  - industrial use: 1 project
  - power generation: 2 projects
- Four projects are currently proposed to expand activities, and improve capture and utilization

(Methane to Markets, http://www.methanetomarkets.org/m2m2009/projects/index.aspx)

# Ukraine's Regulatory Context

- Mineral resources and mines typically owned by the state; however, many mines are leased or have been privatized
  - Privatization is expected to continue
- Methane in coal is owned by state but assigned to companies, mines, and individuals
- Rights to methane are not easily transferred
- Efforts to increase CMM development are being made legislatively

# Ukraine's Regulatory Context

- Green Tariff Law
  - Provides a guaranteed feed-in tariff for renewable energy, including CMM, for 20 years
  - May be so favorable that projects using it cannot claim additionality for carbon credits
  - Adopted in April 2009, however, regulator not yet implementing
- CMM Law
  - A first step to clarify legally what CMM is and how to promote it.
  - Government should issue CMM leases with coal mining leases to mine operator.
  - Allows coal mines to sell their rights to the CMM, but does not require them to do so
  - Requires mines to limit CMM emissions according to norms, fines for non-compliance— very controversial provision

Source: Evans (2009): Coal Mine Methane Activities in Ukraine, Meredydd Evans, presented at U.S. CMM Conference, Boulder, Colorado, October 1, 2009.

# Carbon in Ukraine

- Joint Implementation
  - 9 JI projects approved by Ukraine
- February 2006, Ukrainian Cabinet officially approved set of JI procedures formally outlining the government's procedures for consideration, approval, and implementation for domestic companies such as coal mines to carry out JI projects

# Poland Perspective

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# Poland CMM Projects

- There are 21 CMM recovery projects in Poland
- All projects are at active, underground mines in the Upper Silesian Basin
- Methane is used for
  - boiler fuel: 8 projects
  - coal drying: 4 projects
  - combined heat and power: 5 projects
  - industrial use: 3 projects
  - power generation: 1 project

# Poland's Regulatory Context

- Lack of government incentives/legislation to develop CMM as a clean energy source
- Complicated structure of electricity tariffs in Poland

Source: Skiba (2008): Roundtable on Barriers to Implementation, New Trends in Coal Mine Methane Recovery and Utilization, February 27-29, 2008, Szczyrk, Poland.

# Carbon in Poland

- Joint Implementation
- Green Certificates
  - Prove that certain electricity is generated using renewable energy sources
  - Can be traded separately from the energy produced
  - Do not apply to CMM; however, Red Certificates are of interest as they incentivize combined heat and power

# Czech Republic Perspective

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# Czech Republic CMM Project

- Czech Republic: Only one CMM recovery project is operating according to the M2M Projects Database
  - The project is at an active, underground mine and methane is injected into a pipeline

# Czech Republic Regulatory Context

- Czech Republic relies on domestic coal for almost half of its energy needs, it also imports substantial amounts of gas.
  - Domestic generation of CMM and CBM attractive
  - Czech government has been encouraging CMM/CBM development through direct finance as well as lenient leasing policies
- Gas prices are set centrally by the Energy Regulatory Office, which is hindering the development of the CMM market

# Carbon in Czech Republic

- Joint Implementation
  - Many JI projects submitted, none involve CMM
- Committed to emission reduction of 8 percent below 1990 levels
- Environmental policies are in accord with those stated in “An Environment for Europe,” by the United Nation’s Economic Commission for Europe, which limits mining activities that are hazardous to human health and environment and promotes efficient use of non-renewable natural resources.

# Conclusions

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# Conclusions

- Five countries were selected to compare and contrast characteristics and trends in development of CMM projects based on three constraints
  - Regulatory Context
  - Environmental and Safety Regulations
  - Carbon Trading Schemes

# Conclusions: China

- China's energy market is taking note of CMM as a valuable energy resource – a big power project has been successfully developed, CNG and LNG projects are likely to become commonplace
- Lack of pipeline infrastructure and non-rationalized energy prices will continue to favor local use of gas and promote high value added projects– LNG that can be transported by truck
- Safety regulations are unevenly enforced. New standards for transportation and use of low concentration methane are unsafe and will not solve the underlying problem of substandard gas extraction practices
- Carbon market is developed, but CDM process has slowed development, many investors and mine owners have suggested voluntary market

# Conclusions: USA

- There is a continuing need to address CMM ownership issues. So far has been addressed on a state by state process, but issues on federal land remain largely unaddressed. Need comprehensive solution
- Energy Market is working, projects are generally driven by price of natural gas and electricity – not by carbon
- Carbon Market is strictly voluntary and impact on CMM project development has been minimal, but potential for impact is significant -- especially for VAM projects
- Lack of carbon legislation has introduced uncertainty that constrains CMM project development

# Conclusions: Ukraine

- Ukraine coal companies have developed several CMM projects but ownership conflict and lack of transparency and rule of law have constrained outside investment
- Pending legislation promises to make CMM projects economically viable and attractive to outside investors because non-state ownership of resource will be possible
- Project development does not match growth potential, lack of significant domestic natural gas supply should support development  even without  JI incentives

# Conclusions: Poland

- Poland has long tradition of using CMM beginning in 1930's
- Poland has unique natural gas pipeline system that should allow widespread transportation and use of both high and medium quality CMM
- Lack of government incentives and plan for development leaves potential for growth uncertain

# Conclusions: Czech Republic

- CMM development is market driven as a direct result of reliance on imported energy fuels
- The Czech Republic has successfully promoted CMM project development for many years
- De-regulation of CMM pricing would serve to stimulate widespread development and use of methane resources in all phases of the coal mine life cycle