

Preparing Coal Mine Methane (CMM) Projects in Ukraine

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Global Methane Initiative Technical Seminar:

*Practices and Technologies: Coal Mine Methane Recovery and
Utilization in Ukraine*

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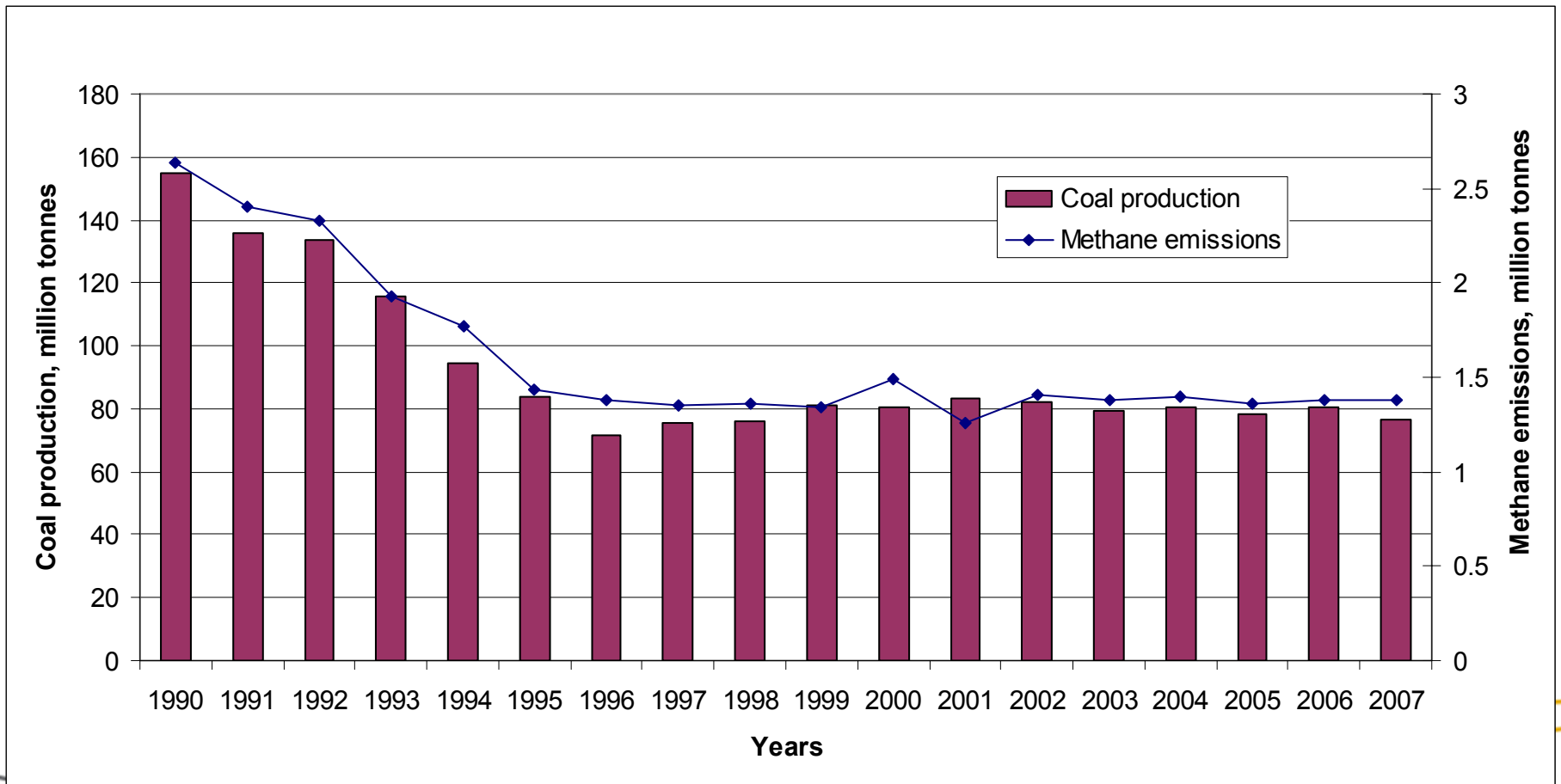
Background on Coal and CMM in Ukraine

- ▶ Historically major coal producer with aging, gassy mines
- ▶ Coal production dropped significantly in recent decades, at 62 mill. tons in 2006
- ▶ Methane emissions from coal mining: 29 Mt CO₂ equivalent in 2006
- ▶ Government strategy envisions major increase in coal production and reform of sector



Sources: IEA and Razumkov Centre

Ukrainian Coal Production and Methane Emissions



Energy Strategy: CMM Projections, Mtoe

	2010	2020	2030
Pessimistic	0.5	1.6	2.2
Reference	0.9	2.7	3.6
Optimistic	1.3	3.8	5.0

- ▶ Official projections
- ▶ Assumes aggressive increase in coal production, which may not take place
- ▶ Does not assume major increase in the rate at which CMM is utilized, which may underestimate the potential, given the very low utilization rates today



Global Methane Initiative (GMI)



Mission: GMI is a voluntary, multilateral partnership that aims to reduce methane emissions and to advance the abatement, recovery and use of methane as a clean energy source.

- ▶ Began in 2004 (as the Methane to Markets Partnership)
- ▶ Targets Five Sector-Specific Areas for Methane Reduction: Agriculture, **Coal Mines**, Landfills, Municipal Wastewater, Oil & Gas Systems
- ▶ 39 Partner Countries and the European Commission, with strong private sector participation
- ▶ The Initiative has leveraged more than \$480 million USD of private financing since 2004.
- ▶ For more information, please visit GMI's website: www.globalmethane.org



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GMI: Coal Sector

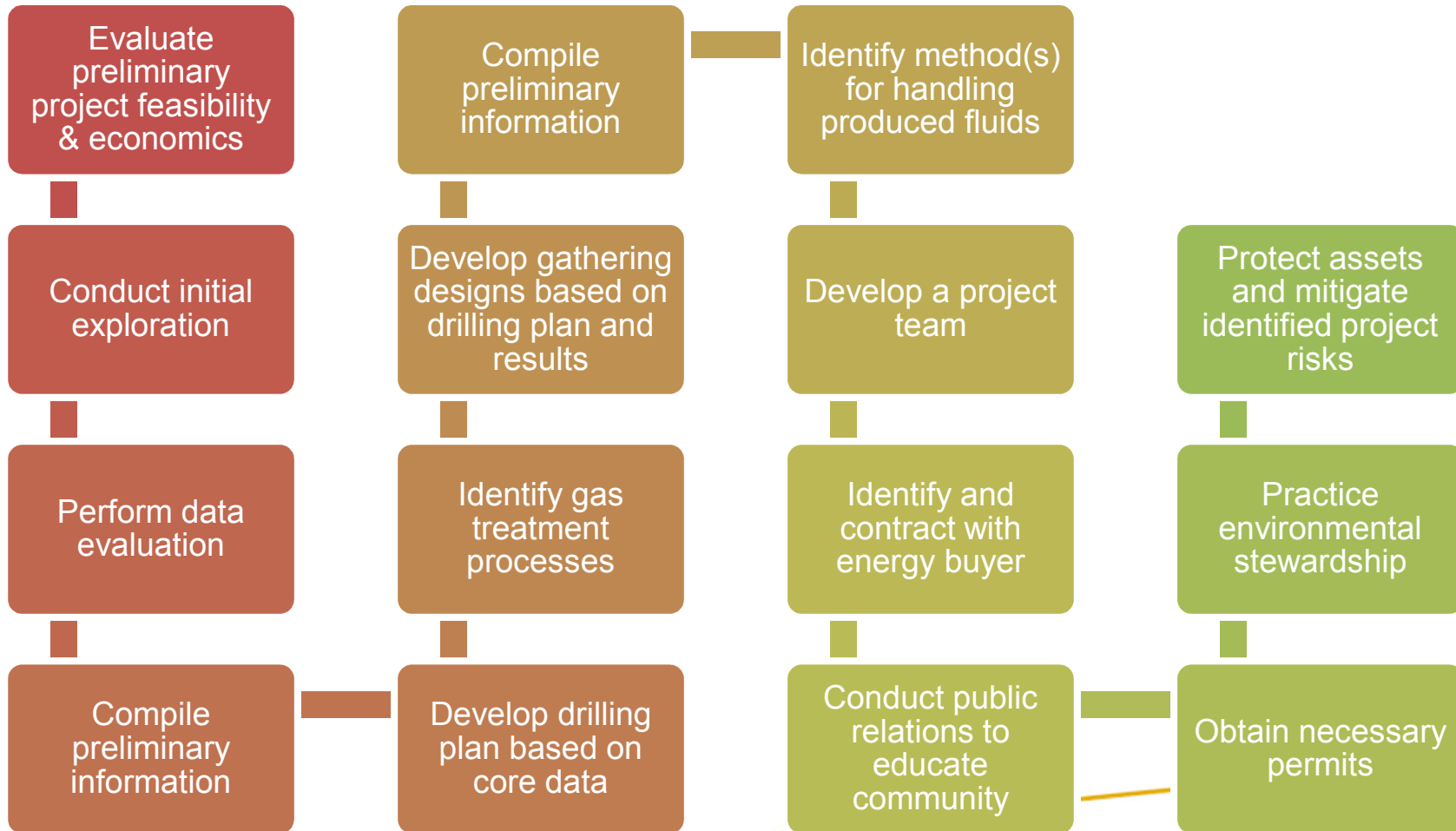


- ▶ EPA is lead agency for GMI
 - Serves as Co-Chair for Coal Subcommittee
- ▶ CMM project identification, feasibility studies
- ▶ Development and maintenance of key information resources: <http://www.epa.gov/cmop/international/index.html>
- ▶ Creation of and support for CMM/CBM Clearinghouses
 - China (China Coalbed Methane Clearinghouse - 1994)
 - Russia [Russian International Coal and Methane Research Center (Uglemetan) - 2002]
 - India (CMM Clearinghouse – 2008)
- ▶ Grant funding for international CMM projects
- ▶ Collaboration with UNECE on Best Practices Guidance

Main Considerations for Preparing CMM Projects

1. Assessing the market for CMM end-use
2. Technical evaluation of resource and technology
3. Economics evaluation and risks
 1. Carbon credits
 2. Government credits

CMM Project Development Activities



Source: US EPA, 2009 *Coal Mine Methane (CMM) Finance Guide*

CMM Project Revenue & Cost Sources

Revenue Sources	CMM Project Costs
<p><u>Revenues</u>: Sale of gas or electricity and/or realize cost savings from avoided energy costs (E.g., existing uses of CMM in Ukraine: Mine boilers and CHP plants; fuel for on-site vehicles)</p>	<p><u>Capital costs</u>: costs associated with the development, construction, and financing of the project (e.g., degasification system, gas collection and gathering system, electricity generation, offsite gas sales, onsite gas use)</p>
<p><u>Carbon Credits</u>: GHG offsets and emission reductions</p>	<p><u>Operating Expenses</u>: Personnel, maintenance, and operation of gas recovery systems; and annual operating costs for compressors, water/gas separator, and equipment maintenance and insurance</p>
<p><u>Tax Credits</u>: Under new tax code, CMM projects don't pay profit taxes until 2020; also reduction in equipment taxes; *Green Tariff Law</p>	<p><u>Royalties, Fees and Other Expenses</u>: Royalties assessed for the gas used by project developers who are not the owner of the gas rights</p>

Organizational and Transactional Costs Associated with Project Development

- ▶ Conducting “due diligence” or examining and verifying the assertions and records of other project parties
- ▶ Performing system design, engineering, and economic assessment
- ▶ Negotiating and drafting legal documents and agreements
- ▶ Obtaining the necessary permits, licenses, and rights-of-way for pipelines or power lines

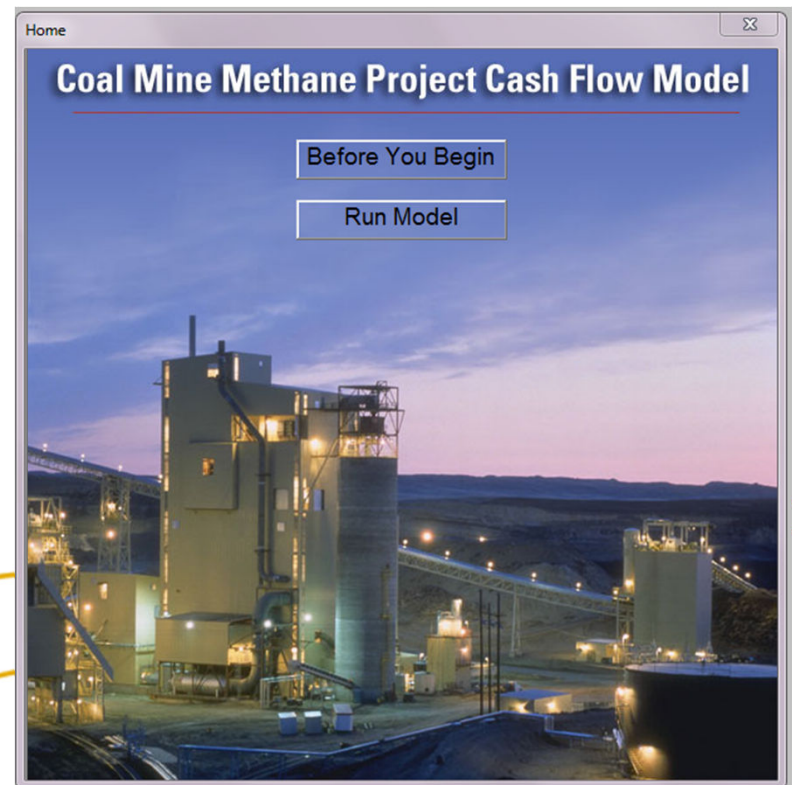
These costs might represent upwards of 25-30% of the total capital costs

- ▶ Other significant non-operational expenses:
 - Taxes
 - Financing-related costs (including interest)

Source: US EPA, 2009 *Coal Mine Methane (CMM) Finance Guide*

Assessing Financial Feasibility

- ▶ Two standard and interrelated methods used to measure an investor's return on equity: Discounted Cash Flow Method and Internal Rate of Return
- ▶ Sensitivity analysis to examine the impact of risks (e.g., changes in gas production or electricity prices) on project returns
- ▶ Coal Mine Methane Project Cash Flow Model Tool
 - A web-based cost benefit analysis tool to assist developers with estimating financial scenarios associated with CMM projects
 - Developed by EPA's Coalbed Methane Outreach Program (www.epa.gov/cmop/resources/cashflow_model.html)



Risks Associated with CMM Projects

Project Development Risks	Construction and Operations Risks
Inability to obtain agreements with mining company and adjacent land owners	Construction cost overruns or delays in construction completion
Indications of marginal gas resource (such as gas quality, rate of flow, and longevity)	Poor gas productivity (such as flow rate, reliability, and quality)
Inability to negotiate energy sale agreements	Technological risk (poor system performance)
Inability to obtain permits	Market risk (drop in revenues due to price changes)
Insufficient development capital	Contractual/legal problems with customers, mine owner/ operator, system suppliers, or regulatory agencies
Inability to secure financing	Mine closing or change in mining plan, causing stranded investment

Law of Ukraine “Peculiarities of Lease or Concession of the Fuel and Energy Complex, which are State-owned”

- ▶ Approved by Parliament on July 21, 2011
- ▶ Promote investment in energy sector (e.g., investment in technical upgrading and modernization)
- ▶ State-owned mines included
 - May indirectly affect CMM recovery and utilization activities by attracting more investment than one may usually expect for state mines

Project Funding Sources

- ▶ Project developers often manage their risk exposure by using project financing to raise debt financing on the basis of a project's projected cash flows
- ▶ Lenders typically require that developers invest equity to demonstrate their confidence in the project's success and willingness to risk their own financial resources
- ▶ Examples of project funding sources:
 - Commercial Banks: Banks might provide short, medium, and long-term corporate and project finance loans at a margin or spread over a benchmark rate such as LIBOR
 - Finance Companies: Often finance projects in earlier stages than banks and investing in a wider range of industries
 - Investment Bankers: provide a wide variety of services that support raising financing

Carbon Financing

- ▶ Ukraine has ratified the Kyoto Protocol as an Annex 1 country (has emission reduction obligations and greater trading rights)
- ▶ 10 CMM projects in Ukraine (7 of these are JI approved projects); in addition 4 JI projects pending approval
 - Projects at Zasyadko and Komsomolets Donbassa received UNFCCC approval in August 2008 (1.2 and 0.3 Mt CO₂ per year, Track 2), Sukhodilksa Skhidna received approval in 2009 (.06 Mt CO₂ per year, Track 1)
 - Zasyadko Mine: 24 CHP units with total capacity of 73 MW for onsite consumption and sale to network
- ▶ Most would install CHP or new heat boilers
- ▶ All submitted for approval in 2006 or later

Conclusions

- ▶ Coal mine methane represents a new energy source for Ukraine
 - Environmentally friendly
 - Can be very profitable
 - Also important safety improvements
- ▶ Designing successful projects requires solid analysis of uses of gas, technologies, economics, and legal environment
- ▶ Ukraine is seeing a boom in CMM projects because of their benefits and supportive policies

Additional Information

- ▶ CMM clearinghouses, information centers and technology transfer programs:
 - China (China Coalbed Methane Clearinghouse - 1994)
 - Russia [Russian International Coal and Methane Research Center (Ugletmetan) - 2002]
 - India (India CMM Clearinghouse - 2008)
- ▶ International cooperation programs:
 - United Nations (UN) Economic Commission for Europe
 - International Energy Agency
 - Bilateral (eg. U.S. EPA with several countries)
 - Global Methane Initiative (formerly, Methane to Markets Partnership)