

Developing the Methane Resources of Ukraine

Ukraine Methane Group CBM/CMM Development Projects

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Coalseam Methane Recovery and Utilization BACKGROUND / RATIONALE

Ukraine:

- a developing country that needs to increase energy supply and efficiency
 - ***CMM/CBM immediately available, with low-cost extraction***
- has known coal reserves and underdeveloped coal industry
 - ***CMM/CBM is local source of alternative clean fuel, available at all active and inactive coalmines, and in the surrounding coal beds***
- coal mines need rehabilitation and improvement to mine safety and efficiency
 - ***CMM/CBM finances coalmine modernization programmes***
- can produce methane of sufficient quantity and quality for use as fuel to generate power and heat
 - ***existing source of gas as by-product of coal mining***



CMM-I Project:

- provides improved degasification of active, inactive coalmines and future coal seams
 - – ***increases mine safety and productivity***
- creates efficiency of coal extraction and coalmine operations through enhanced drainage/ventilation
 - – ***increases mine profitability***
- produces heat and power for use by the coalmine and surrounding community
 - – ***increases energy self-sufficiency and security***
- produces local energy to stimulate small enterprise (cottage industry) development
 - – ***increases community economic growth***
- creates demonstration of technical and commercial viability for methane industry programme
 - – ***increases regional social stability***



CMM-I Project:

Increased Mine Safety and Mining Efficiency
Reduction of Emissions
Clean-Fuel Energy Production

Self-Sustaining Projects Commencing with Two Leading Coalmines in the Donets'k Region

- Upgrading and training for mine degasification safety equipment, best practices, and transfer of technology
- Modernisation and expansion of methane drainage systems
- Utilisation of methane for electricity and heat generation
- Capture of methane for CO₂ Emission Reduction Units



ENHANCED METHANE RECOVERY

Ventilation Shafts/Drainage System

Gob Wells / Horizontal (In-Mine) Wells

Improve Mine Degasification

- Rehabilitate existing pump station
- Install new pipe and fittings in selected areas
- Upgrade existing equipment and systems / Install new components



Improve Wells

- Drill new 'Gob' wells
- Drill new horizontal (in-mine) and cross-measure wells



NEW GATHERING AND METERING SYSTEM

Install Low-pressure Piping and Modern Controls

Design, Engineer, Upgrade Methane Gathering System

- Gas Industry International Standards and Methodology
 - Ukraine Manufactured Pipe, Connections, and Valves
 - Ukraine Contractor Installation
 - Technical Assistance from International Industry Experts
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Design, Engineer, Install Methane Metering System

- International Gas Industry Standards and Methods
- Compliance with Kyoto Protocol and UNFCCC Regulations
- Technical Assistance from International Industry Experts

COALSEAM METHANE RECOVERY AND UTILIZATION

Design, Engineering, Installation, and Training

- Modular Plants– Generators, Controls, Heat Exchangers
- Containerised, moveable, compliant with environmental standards
- Computerised remote monitoring and data collection system
- Proven, methane-fuelled engines from Caterpillar, Jenbacher, Deutz



CMM Project-I

Two Coal Mines of the State Enterprise 'Makeyevugol'
Donbass Coal Basin, Donets'k

- Long-Term Power/Heat Purchase Agreement (PHPA) for entire output
- All Licenses, Permits, and Approvals for extraction of methane and use of gas for power generation
- All Licenses, Permits, and Approvals for operating power plant
- All Permits and Approvals for sale and distribution of electricity to the end users

CMM Project-I

Demonstration Project for initial Two Coalmines
Donbass Coal Basin, Donets'k

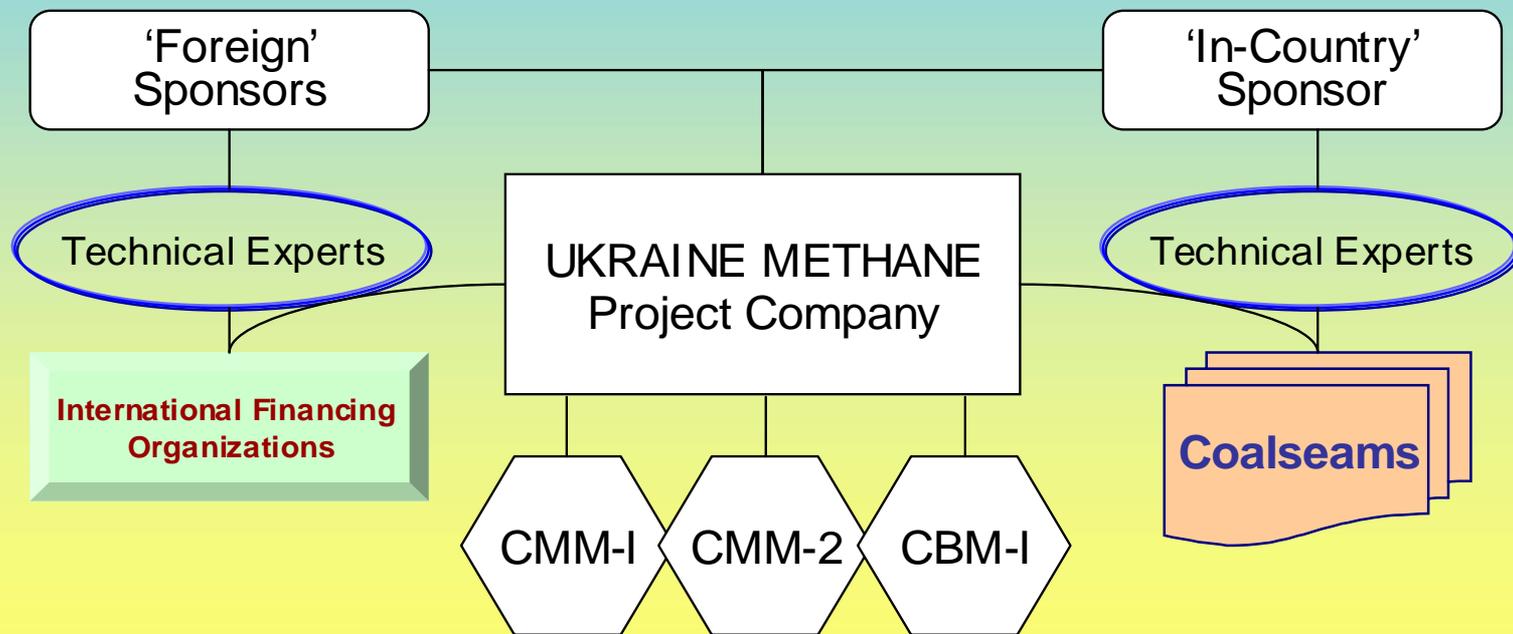
- Total Project Costs = \$15.3 Million

- Equity/Equity Financing = \$ 5.350 Million
- Project Finance = \$ 9.950 Million

10-year term; interest rate of less than 7%
Direct Loan from U.S. Government Agency–
Overseas Private Investment Corporation (OPIC)

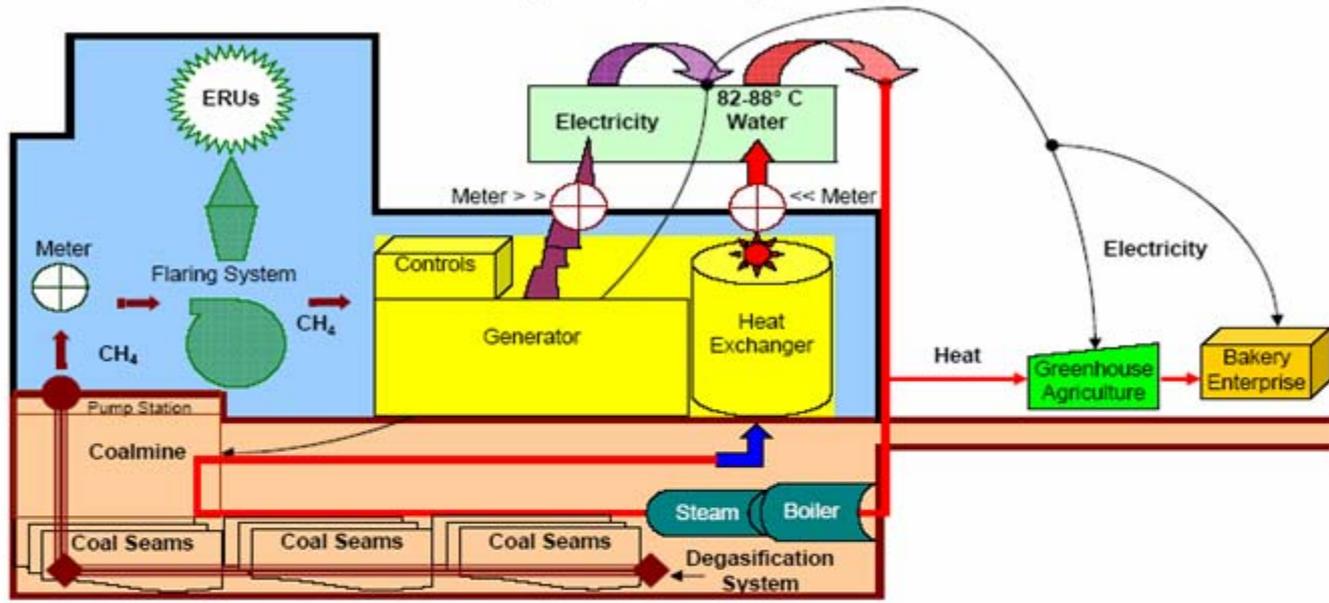
Ukraine Coal Mine Methane Clean, Economical, Alternative Fuel

- *High-Efficiency Natural Gas Power Plants*
- *Electricity and Heat for Local Communities*
- *Economic Development Stimulus for New Industries*



Global Methane Partners / Covalent Energy

Figure 11: Project Flow Diagram



<div style="border: 1px solid black; padding: 5px; text-align: center;">Coalmine</div>	}	<i>Licence/Use Permit; Approval by GoU and Regional Administration Land Area & Access: Flaring System, Heat/Power Plant, Small Enterprises Gas Connection (Exclusive) from Surface Discharge of Drainage System Operating Agreements: Pump Station/Degasification System;</i>
<div style="border: 1px solid black; padding: 5px; text-align: center;">Energoinpex and/or Makeyevugol Coal</div>	}	<i>Off-take Purchaser/Re-Seller-- P/HPA Co-Sponsor of Community Development/Small Enterprise Programme Supply Heat/Electricity to Small Enterprises</i>
<div style="border: 1px solid black; padding: 5px; text-align: center;">Ukraine Methane Partners / Energocapital</div>	}	<i>Project Developer Arrange, Secure, and Administer Funding/Project Finance Project Manager/Joint Operator of Pump Station/Degasification System Producer/Seller of Power/Heat, Technology Transfers</i>
<div style="border: 1px solid black; padding: 5px; text-align: center;">Caterpillar, Inc.</div>	}	<i>Supply Turn-key Heat/Power Plant-- Generator, Controls, Heat Exchanger Technical Assistance; Training Maintenance/Service; Financing Support</i>

International Consortium of Sponsors and Participants

PROJECT TEAM EXPERIENCE

Experienced Project Managers

- *expert team with degrees in law, business, and finance; English & Ukrainian language*

Internationally Recognized Technical Assistance

- *renowned expertise in CMM/CBM; industry leaders in energy and environment*

Leading Suppliers of Equipment and Technology Transfers

- *multi-national companies, providing engineering, apparatus, service*

U.S. and E.U. government relationships and support

- *EPA, DOE, USAID, TDA, OPIC, TACIS, EBRD, ADB, World Bank Group*

Government of Ukraine support

- *Ministries of Energy/Environment/Economic Development; Regional Administration*

Global Methane Partners

Covalent Energy

Methane Services Group

EnergCapital

Makeyevugol Coal Association

Advanced Resources International

REI Drilling

Caterpillar Power

Econergy International

Winrock International