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**FACILITATING DEVELOPMENT OF COAL MINE METHANE  
PROJECTS IN EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA**

submitted by

the UNECE Committee on Sustainable Energy

through the Ad Hoc Working Group of Senior Officials

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Committee on Sustainable Energy

**PARTNERSHIPS  
PARTNERSHIPS TO SUPPORT THE IMPLEMENTATION OF  
ENVIRONMENTAL POLICY**

**FACILITATING DEVELOPMENT OF COAL MINE METHANE PROJECTS IN  
EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA**

**Summary**

The United Nations Economic Commission for Europe (UNECE) carries out a cooperative programme on coal mine methane (CMM) under the auspices of its Committee on Sustainable Energy. These activities are part of a larger effort by the UNECE to promote sustainable development within the energy sector and to enhance international economic cooperation to achieve this goal. CMM capture and use addresses several interrelated issues and successful programmes deliver multiple socio-economic benefits including improved mine safety, reduced greenhouse gas (GHG) emissions, and local energy production. One of the more significant challenges that the industry has faced and continues to face is access to financing. UNECE, together with government and industry partners, has initiated a technical assistance programme to develop the skill set necessary to design CMM projects, integrate those projects with mining operations, and prepare investment grade documentation to secure financing for the projects. This paper provides a brief background on the benefits of CMM recovery and use, opportunities for project development in the UNECE region, an overview of the UNECE programme on coal mine methane, and a summary of the project to facilitate financing of CMM projects. The common theme throughout the paper is the critical role played by partnerships; partnerships between government and industry, partnerships amongst various industry players, and partnership with the financial community.

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### I. BACKGROUND

1. Methane is a natural by-product of coal mining. As the coal is mined, the methane is released. For underground mines, the release of methane presents a serious safety threat and methane-related explosions have been a problem since underground mining first began. The coal industry reduces this threat through the use of ventilation systems. Additionally, the mines may supplement ventilation with methane degasification (or drainage) systems that employ in-mine and surface wells. These wells and associated gathering systems can produce methane before, during, and after mining occurs. While the methane concentration in ventilation systems is generally below 1 per cent of air by volume, methane in drainage systems can range from concentrations in single digits to almost 100 per cent.

2. Coal production, transportation and use account for approximately 39 per cent of global GHG emissions, and much attention has been drawn to coal's impacts on air quality and climate change.<sup>1</sup> However, coal is also the most geographically diverse and affordable of all fossil energy resources, and is expected to continue playing a central role in the global energy mix, especially in developing countries and economies in transition. Significant efforts are therefore underway to reduce the carbon footprint of coal throughout the supply chain. In the near term, capture and use of methane produced during mining is one of the more attractive and cost-effective options at the production end.

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<sup>1</sup> Energy Information Administration, U.S., *International Energy Outlook 2007*, Washington, DC USA, May 2007, p. 73.

3. Methane has a global warming potential 23 times that of carbon dioxide (on a 100-year timeframe) and accounts for the second largest contribution to global GHG emissions after carbon dioxide. The near term impact of methane is even greater because its warming potential is amplified by its relatively short atmospheric life of approximately 12 years. However, methane is unique among GHGs in that it is a fuel source and can be used in natural gas pipelines, as fuel for electricity production, and in industrial applications such as methanol production. There are other socio-economic benefits as well. For the coal sector, the mine safety benefits cannot be overstated – it is literally a matter of life and death.

4. Recognizing the many benefits associated with CMM recovery, UNECE launched a programme in 2004 to promote implementation of CMM projects in the region through information exchange, identification and implementation of best practices, and technical assistance to plan, design and finance CMM projects. This effort has received valuable financial support from the United States Environmental Protection Agency (US EPA) and cooperates closely with the Methane to Markets Partnership, an intergovernmental partnership of 20 countries working with the private sector, international organizations and non-governmental organizations to reduce methane emissions.

## II. OPPORTUNITIES FOR CMM CAPTURE AND USE IN THE EECCA REGION

5. The potential for CMM utilization in countries of the Eastern Europe, Caucasus, and Central Asia (EECCA) region is substantial. Many of the economies of the EECCA region produce significant quantities of CMM. The Russian Federation, Ukraine, Kazakhstan, Poland, Romania and the Czech Republic are particularly large sources of methane. In addition, some opportunities may exist in other countries. A report prepared for the seventh session of the Ad Hoc Group of Experts on Coal in Sustainable Development in 2003 noted that by 2010, emissions of CMM from economies in transition, including the European part of the Commonwealth of Independent States (CIS) are projected to total 82 MtCO<sub>2e</sub>.<sup>2</sup> Marginal abatement cost analyses performed by the US EPA indicate that a significant quantity (9.3 MtCO<sub>2e</sub>) of these emissions may be profitable without additional financial incentives, and at a rate less than €8/t CO<sub>2e</sub>, the majority (51.9 MtCO<sub>2e</sub>) could be profitably developed.<sup>3</sup>

6. It should be noted that many of the countries in the region have a long history of CMM recovery. Mines in the Czech Republic, Kazakhstan, Poland, the Russian Federation, and Ukraine have had success in using CMM for on-site boiler fuel, natural gas distribution, and vehicle fuel and power generation. At the inception of this programme in 2004, however, the programmes in place, with the exception of the Czech Republic, were only beginning to realize the full potential of the resource base. This is now changing as capital is moving into the region in pursuit of carbon projects, the mining industry is privatizing and is well-capitalized compared

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<sup>2</sup> Schultz, Karl, *Potential for Economies in Transition to Leverage Kyoto Flexible Mechanisms: General Considerations for Coal Mine Methane*, prepared for Sixth Session, UNECE Ad Hoc Group of Experts on Coal in Sustainable Development, 17-18 November 2003.

<sup>3</sup> US Environmental Protection Agency. *International Analysis of Methane and Nitrous Oxide Abatement Opportunities: Report to Energy Modeling Forum, Working Group 21*. June, 2003.

with just three years ago, regulatory barriers are slowly being eroded, and the mining sector is recognizing the benefits that these project offer. Still, compared with some other countries such as Australia, Germany, the United Kingdom and the United States, substantial work remains. This will be discussed in greater detail later in the paper.

### **III. UNECE PROGRAMME ON COAL MINE METHANE**

7. The UNECE programme on coal mine methane has three principal components: the Ad Hoc Group of Experts on Coal Mine Methane, the Task Force on the Economic Benefits of Improving Mine Safety through Extraction and Use of Coal Mine Methane, and the extrabudgetary project to support financing of CMM projects.

#### **A. Ad Hoc Group of Experts on Coal Mine Methane**

8. The Ad Hoc Group Of Experts on CMM, created in 2004, serves as an expert forum for the exchange of ideas and best practices to encourage the implementation of effective CMM capture and use programmes. The focus of the Group of Experts is principally the UNECE region and more specifically the countries noted in section III. However, representation in the Group of Experts is global with participation from non-UNECE member countries, including Australia, Brazil, China, India, Japan, Mexico, and Nigeria. In addition, other international and intergovernmental organizations participate, including the Methane to Markets Partnership, International Labour Organization, World Bank, and United Nations Development Programme (UNDP). The private sector through investors, project developers, vendors and the mining community is very active.

9. The wide range of actors participating in the work of the Ad Hoc Group of Experts underpins the importance of establishing successful partnerships amongst the different participants. Given the wide range of technical, market, and legal barriers to overcome, it is extremely difficult for one organization to successfully manage all of them. Working together, governments and industry can resolve legal and regulatory barriers, while the private sector plays a necessary role in bringing capital to the market that is beyond the means of most governments. With relatively tight margins on some projects, the private sector also brings an entrepreneurial and more flexible mind-set that can lead projects to profitability.

10. The Ad Hoc Group Of Experts meets annually in Geneva to discuss issues of importance to the coal and CMM industries, and to establish a programme of work for the coming year. The Group of Experts seeks to identify issues critical to the success of the industry where its expertise can help overcome problems. Currently these efforts include developing a harmonized terminology across the CMM industry and focusing on use of low-quality methane at or near the explosive range which a significant source of emissions and potential, but also technologically and legally challenging.

## **B. Task Force on the Economic Benefits of Improving Mine Safety through the Extraction and Use of Coal Mine Methane**

11. CMM projects are divided between upstream degasification and downstream utilization. Upstream activities are associated directly with the mining operation and are generally undertaken to enhance mine safety. Downstream activities are mostly external and have limited impact on the mining operations. Although downstream operations are of great interest, mine safety is the first priority for all industry participants. This sometimes leads to shortsighted perspectives that do not recognize that CMM utilization projects can help finance improvements to the upstream operations. The Group of Experts has thus placed great emphasis on methane-related mine safety issues and has created the Task Force to engage in an active and effective dialogue on safety issues. The Task Force has already prepared several case studies that show the positive economic outcomes that investments in methane drainage can bring (ECE/ENERGY/GE.4/2007/5 to /9). The Task Force is also currently examining regulatory provisions that may actually inhibit rather than encourage effective drainage.

## **C. Project Finance**

12. A significant barrier to further implementation of CMM projects has been the difficulty in securing adequate finance. Until recently, most CMM projects were self-financed, and many project sponsors were ill prepared to seek funding in the capital markets. They lacked the skill set to prepare investment-grade documents to internationally acceptable standards, did not know about or have access to the full suite of debt and equity options available in the markets, and did not have experience presenting projects to the financial community.

13. UNECE has a long and productive history working with the governments and coal industries in the UNECE region, many of which are among the world's largest coal producers and are also among the world's major emitters of CMM. These include the Czech Republic, Germany, Kazakhstan, Poland, Russia Federation, United Kingdom, Ukraine and United States. The UNECE also has a successful track record of working closely with the finance industry to build the capacity of member countries to better understand and apply financial engineering principles and to develop the appropriate financing vehicles for alternative energy projects such as energy efficiency projects.

14. In 2004, UNECE began a project with funding from the US EPA to address the financial shortcomings in the region's CMM industry (ECE/ENERGY/GE.4/2004/2). The objective of the project is to assist potential project sponsors identify project opportunities for CMM recovery and use, work with them to design and structure the project, provide technical support and training in the development and presentation of investment grade documents, and create channels to the financial community to propose the projects. To ensure sustainability, capacity building and training are key components of the project scope. The project will continue through 2008.

#### **IV. CURRENT STATUS OF PROJECT TO SUPPORT FINANCING OF CMM PROJECTS**

15. The first two years of the project by design focused on the Russian Federation and Kazakhstan, and will open to the remainder of the region in fourth quarter 2007. Progress on the project has been slower than expected. The greatest challenge is the profound change occurring in the carbon markets. When this project was originally formulated in 2003, the investment situation was very different. Capital flows to carbon mitigation projects were very limited, serious investors were few, and the mining concerns in most transition economies and developing countries were still very unsophisticated about capital markets. The situation has changed dramatically. Today, the carbon markets are highly capitalized and CMM projects are considered an attractive asset class. In the Russian Federation and Kazakhstan, the major mining companies have privatized and consolidated their assets creating very sophisticated, well-managed companies with significant capital available to develop their own projects or seek partnerships. The result has been that there has been very little interest expressed by the mining companies in the Russian Federation to cooperate with the UNECE under this programme except for projects using ventilation air methane (VAM). In Kazakhstan, several companies have already established relations with project developers so again opportunity is limited.

16. Two other important challenges are found in both the Russian Federation and Kazakhstan: regulatory frameworks and project scope.

- (a) In the Russian Federation, the government only recently established rules for Joint Implementation (JI) projects. The late date for JI rules has, until now, deterred CMM project sponsors within the Russian Federation. Kazakhstan has not yet ratified the Kyoto Protocol and this is also an inhibiting factor for investment.
- (b) Project scope has arisen as major hurdle in negotiations between project developers and the mining community. Developers and investors are principally interested in the downstream, or utilization, aspect of a project. This is the segment of the supply chain that produces revenues through carbon markets and energy sales. In addition, it is also the segment for which they exert the greatest influence and even control. On the other hand mine degasification, the upstream segment, incurs cost rather than producing revenues, making it of little interest to developers. Methane degasification is completely controlled by the mining entity and the regulatory authorities further reducing its attractiveness as an investment vehicle. The investors and developers have, therefore, historically resisted investment in degasification programmes preferring to separate the upstream and downstream activities. The mining industry in many developing and transition economies, however, is much more concerned with safety and degasification than CMM utilization. It has shown very limited interest in CMM projects unless they result in significant upgrades to the degasification systems. As a result, successful development models more and more must incorporate both upstream and downstream infrastructure and operations investments to receive the support of the mine operators.

17. In looking forward, the secretariat has spoken with CMM project developers and many representatives of the financial sector, especially those engaged in the carbon markets. Generally, investors corroborated the views expressed in this paper. The volume of capital searching for GHG mitigation projects is staggering. In addition, the credibility of the investors is very high claiming the full range of known commercial and investment banks, corporate leaders, and boutique investors. The mining companies and the associated CMM project potential in the EECCA region, especially at the privatized mines, are very attractive targets for project developers and investors. As such, they are seeing substantial interest from investors. On the other hand, projects using VAM are more risky, technologically challenging, and expensive. There is far less interest in these projects from investors. Thus, this is one area where the mines in the EECCA region may be more open to cooperation with UNECE.

18. Among other conclusions drawn from the UNECE's experience and discussions with investors and the CMM community:

- (a) Many investors and even some in the mining community see value in cooperating with the UNECE as any projects brought forward would already be the subject of substantial analysis and endorsement;
- (b) Among carbon assets, CMM projects are one of the most desirable sectors given the social benefits of mine safety, the high production of emissions from single sources, the reasonable ease of quantifying and verifying emission reductions, and the growing stability of the coal sector;
- (c) Investors are growing more creative by offering a range of purchase options, including "bundled" deals whereby the mine bundles the coal sales with the emission reductions.
- (d) Carbon buyers are developing realistic expectations of supply and lowering their threshold for entering into agreements from 500,000 tonnes and 100,000 or 50,000 tonnes of CO<sub>2</sub> between 2008-2012;
- (e) Mine operators are demanding engineering and investment support to upgrade methane degasification as a condition for emission reduction purchase agreements (ERPAs) for coal mine methane; and
- (f) The equity markets may be over-capitalized given the massive inflows into the carbon markets in the last 24 months; however, access to debt financing remains very difficult for many project developers because of higher risk profiles and little collateral – an emission reduction purchase agreement is often not an acceptable collateral instrument.

## V. CONCLUSIONS

19. The opportunities for CMM recovery and use in the EECCA region are substantial, and the benefits could have lasting social, environmental and economic benefits. Although there is some progress in implementing projects, it is limited in comparison to other regions such as East Asia. For the industry to expand, it is critical that project sponsors have ready access to adequate funds to meet the high capital costs of installing and operating methane drainage and utilization equipment for periods of 10 to 20 years. Taking this next step requires considerable effort on the part of the coal and CMM industries, host governments, international institutions, and the financial community. Together these stakeholders can build networks to better understand the opportunities and apply the appropriate financial vehicles. The UNECE, working with the Methane to Markets Partnership, is supporting these efforts, first as a forum to facilitate partnerships and second as an international organization actively supporting the financing of CMM projects through a technical assistance project.

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