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COALBED METHANE EXTRA

A publication of the Coalbed Methane Outreach Program (CMOP)

http://www.epa.gov/coalbed

Project Development Opportunities Overseas

U.S. Environmental Protection Agency (U.S. EPA) estimates that up to 40 percent of global methane emissions from coal mining could be controlled through aggressive methane drainage and use programs. Project development opportunities exist in many coal-bearing countries, and interest in identifying and implementing coalbed methane (CBM) and coal mine methane (CMM) projects both within and outside the U.S. is growing at a rapid rate. The extent of interest in such opportunities is reflected by the over 50 CBM and CMM abstracts submitted by authors from numerous countries for the Second International Methane Mitigation Conference to be held in Russia in June of 2000 (see notice on page 5).

In the last issue of *Coalbed Methane Extra* we discussed the mission and activities of three international CBM and CMM development centers: the China Coalbed Methane Clearinghouse, the Russian Coalbed Methane Center, and the Ukraine Alternative Fuels Center. In this issue, we expand our review of international opportunities by briefly highlighting selected CBM and CMM development activities around the world.

Belgium

The recent growth in CBM/CMM development in the U.S and elsewhere, and growing recognition of CBM/CMM as a valuable resource, have led to efforts to characterize and assess potentially productive areas of Belgium's gassy Southern Basin. Engineers in Belgium are investigating not only opportunities for classical CBM production but also the potential to execute CO_2-enhanced production. In this process, CO_2 captured from local industrial facilities would be injected into the coal seam where it would preferentially adsorb to the coal thereby liberating adsorbed methane. If successful, this approach would enhance methane production from the coal and would reduce industrial CO_2 emissions thereby further contributing to climate change mitigation.

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World Bank Launches Prototype Carbon Fund

On January 18, 2000, the World Bank established an important financing mechanism to promote atmospheric greenhouse gas (GHG) emission reduction projects when it announced its Prototype Carbon Fund (PCF). The PCF pilot project is a lending vehicle designed to help establish an international market for GHG emissions trading that will transfer both financial resources and climate-friendly technology from industrialized countries to developing countries and economies in transition.

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West Virginia Proposes Tax Relief for CBM Developers!

The West Virginia State Senate, Committee on Finance, is considering a Bill to amend the West Virginia Code to exempt certain coalbed methane (CBM) production wells from severance taxes. The Bill recognizes that:

- CBM is underdeveloped and underutilized in the state,
- Miner safety is enhanced by encouraging CBM drainage in advance of mining,
- U.S. Environmental Protection Agency's Coalbed Methane Outreach Program encourages CBM development, and
- Some incentive is needed to offset the initial cost of CBM drainage well placement.

Therefore, to promote the beneficial capture and use of CBM in West Virginia, the Bill provides for an exemption from the tax levied upon all persons in the state engaged in severing CBM for sale, profit, or commercial use. The exemption would apply to any CBM well placed into service from January 1, 2000 until January 1, 2011.

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Don't Miss the Second International Methane Mitigation Conference!

The U.S. Environmental Protection Agency (U.S. EPA) is cosponsoring an important conference addressing a host of topics pertaining to international coal mine methane project development from June 18 - 23, 2000 in Akademgorodok (Science City), Novosibirsk, Russia (see notice on page 5). For further information, or to register, contact Karl Schultz, U.S. EPA, Coalbed Methane Outreach Program, by e-mail at schultz.karl@epa.gov.

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China

Coalbed methane reserves in place in China are 30 to 35 trillion m^3, according to recent estimates. Exploitable reserves (i.e., <2,000 feet deep and with gas contents >5 m^3/ton) are as great as 14 trillion m^3, primarily distributed in eight areas in northern and northwestern China. Since the mid-1980s, more than 100 exploration wells have been drilled in approximately 20 areas in China, but many have been unsuccessful due to a variety of technical factors and geologic conditions (low permeability, etc.). Coal fields in the northeast of the country (i.e., the Qinshui, Ordos, and North China (Huabei) basins), however, do offer high potential for CBM production. Currently, the southern portion of the Qinshui Basin is attracting considerable attention, with estimated reserves of approximately 99 billion m^3 exhibiting good gas production (i.e., in excess of 4,000 m^3/day) in test wells.

The potential for substantial CBM/CMM production in China is reflected by the level of interest from international energy companies. For example, the China United Coalbed Methane Corporation, Ltd. signed CBM production sharing contracts with Texaco for CBM development in Huabei in Anhui Province, and with Phillips and Arco for CBM development in the Linxing and Sanjiao areas of Shanxi Province. By combining such partnerships with the substantial geological, coal mining, and gas development expertise of various government organizations, the Chinese government seeks to expand CBM/CMM development in China to reach 5 billion m^3/year by 2005 and 10 billion m^3/year by 2010. In addition, more than 20 foreign companies and 8 major coal mine administrations currently are participating in the Business Advisory Committee, recently formed in Beijing to promote economically and environmentally sound CMM development in China.

Refer to the December 1999 issue of the Coalbed Methane Extra for further discussion of current CBM/CMM development initiatives in China.

India

As one of the world's largest coal producers, coal is now, and for the foreseeable future will remain, India's primary energy source. However, exploiting India's coal resource also results in CMM release to the atmosphere. To avoid the negative implications of such release (climate change effects and wasting a valuable energy resource) a demonstration project is currently underway to promote the recovery and commercial utilization of CBM.

The Government of India, the United Nations Development Programme, and the Global Environment Facility are jointly funding the project at approximately US$15 million, and India's Ministry of Coal will be responsible for implementation. By applying three advanced drilling techniques, the project will tap methane in virgin coal seams and in gob areas, and will fuel gas-fired power generation facilities and a methane vehicle refueling station. In addition to demonstrating the efficacy of CBM drainage and use technologies, other important outcomes of the project will be (1) improving the in-country capability for designing and implementing safe, effective CBM development projects, and (2) developing an action plan to replicate the successes achieved in the demonstration project.

Japan

The Ishikari coal field is Japan's gassiest, with average gas content of approximately 9.5 m^3/ton and with average gas emission volumes exceeding 45 m^3/ton. Because of the coal's high gas content, mines that were working the field were closed in 1995 and remain so today. However, interest is now increasing in exploiting this energy resource to feed the region's growing demand for natural gas by developing CBM and CMM through surface boreholes and gob (goaf) wells.

Obstacles to producing this gas resource do exist, however. These include the lack of a gas transmission line in Hokkaido, low electricity prices, and high drilling costs. The latter is the major challenge facing CBM/CMM production in the region. The most promising project configuration in this area may be methane production from a small number of wells to feed small-scale power generation for private use. Alternatively, the January 17, 2000 Oil and Gas Journal reports that NKK Corporation has used CBM

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as feedstock to synthesize dimethyl ether (DME), an aerosol propellant that also can substitute for diesel fuel. After further testing and a 2-month continuous production run, the company plans to refine its design for a 500 tonne/day plant to synthesize DME from CBM. NKK will offer the plant for application in China and other nations.

Kazakhstan

Fossil Energy Developments, LLC. (a joint venture between Materials Development Corp., D'Amico Development Corp., and Panther (UK) LTD) is planning a project to capture CMM from the eight active coal mines in the Karaganda Basin, the largest coal basin in Kazakhstan. An initial feasibility study is determining if CMM can be extracted economically. Past investigations indicated that substantial volumes of methane are resident in the basin. The feasibility study will ascertain the difficulty associated with drilling to access the gas and will identify the best drilling and reservoir stimulation techniques.

Methane reserves in the Karaganda Basin range from 1 to 3 trillion m^3. That substantial reserve will allow the project to address many power needs in and around the basin. The project will reduce greenhouse gas (GHG) emissions via capture and productive use of the methane and provide low-cost clean fuel to boilers and steel mills, thus further reducing pollution and improving the economy. It will focus initially on local power production, but it may be expanded to include several combined heat and power facilities in the 25 to 50 MW size range scattered through the north and northeast of the country. Furthermore, there is considerable interest in using large quantities of the captured CMM to fuel production of high-value strategic steel alloys (e.g., using chromium, nickel, and molybdenum).

Planning the Fossil Energy Developments project involves the participation of several parties. These include the Kazakhstan Energy and Natural Resources Ministries; the U.S. Environmental Protection Agency, Department of Energy, Department of Commerce, Department of State, and Agency for International Development; Ispat Karmet (an entity made up of coal mines, steel mill operators, and one power plant operator); and various other government bodies. If the feasibility study proves successful, project development efforts will begin immediately. The long-term goal is to expand CMM development to the other (approximately 15) mines in the Karaganda basin, then to mines in the other major Kazakhstan coal basin, the Ekibastuz, and ultimately to the remaining scattered coal mines in the rest of the country.

Poland

Poland's previously state-owned coal industry is in a state of transition to a competitive, market-based sector. In 1999 the World Bank approved US$300 million in loans to assist in the restructuring process, to reduce environmental impacts associated with coal mining, and to reduce restructuring's impact on coal miners and their families. As that restructuring is implemented, it will offer CBM/CMM developers opportunities to pursue projects that improve environmental quality. For example, deep coal mines in Poland often must pump saline water from the mine workings. The saline wastewater requires treatment before release to natural surface waterways, because of the potential for substantial ecological damage to the aquatic system. As many mines that produce saline wastewater also produce methane, that gas could fuel desalination equipment, thereby providing a low-cost means of achieving requisite wastewater treatment while reducing local air and water pollution. Aquatech Services already has demonstrated the efficacy of such a CBM-fueled system at the Morcinek mine in Upper Silesia and is developing commercial applications for other sites. The Polish Minister of the Treasury is evaluating the applicability of the CBM-fueled desalination system to mines that will survive the restructuring process.

Traditionally, coal and lignite have fueled Poland's electric power industry, but interest in natural gas-fired generation is growing. Projections indicate that with a rise in natural gas consumption will come a rise in natural gas imports. Those projections do not take into account the extent to which increased CBM/CMM production could meet increases in demand.

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Please update us if your contact information (address, e-mail, or phone/fax number) changes.

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Russia

With methane reserves at active Russian mines estimated at 160 billion m^3 and overall methane reserve estimates ranging from 510 billion m^3 to over 13 trillion m^3, there is substantial opportunity for CBM/CMM capture and productive use. One challenge facing such expansion, however, is the need to link gas production with end users, especially industrial consumers of heat and electrical power. The Kuznetsk coal basin (or Kuzbass), where more than 70 mines currently operate, contains extensive CBM reserves. A number of energy-intensive industries are located in the region. Opportunities may exist, therefore, to tap the CBM/CMM reserves of the Kuzbass to provide low-cost energy for these industries while also assuring mine safety and promoting coal production efficiency. For example, development has begun on a project to drain approximately 10 million m^3 per year of methane at the Pervomayskaya Mine for cofiring in coal-fired boilers.

Coal industry restructuring in Russia is resulting in closure of unprofitable underground coal mines. Many of those mines are capable of producing substantial quantities of methane. To make best use of the available CMM resource at these mines even after they close, efforts are underway to identify and implement the best techniques for gob (goaf) gas recovery. Developers are considering combining via pipeline the possibly unsteady gob gas flows from multiple mines to assure the level of gas flow reliability required by CMM end users.

Refer to the December 1999 issue of the Coalbed Methane Extra for further discussion of current CBM/CMM development initiatives in Russia.

United Kingdom

Although once an active industry in the UK, today few underground coal mines remain in operation. While mining itself has declined, beneficially using the residual methane present in abandoned mines has increased. CMM from abandoned mines in the UK exhibits methane concentrations typically ranging from 60 to 80 percent, and up to 90 percent in some cases. Recognizing the potential value of methane that was escaping to the atmosphere from such mines, a number or organizations have focused on extracting CMM and tapping its energy content.

One such group, Coalgas, which was formed in 1994 specifically to exploit CMM from abandoned mines, brought two projects on line in 1999. At Markham, Coalgas supplies methane for industrial use, while the project at Steetly fuels electricity generation. Coalgas' license area contains at

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Upcoming Events

Coalbed and Coal Mine Methane - A New Energy Resource for the 21st Century
Denver, Colorado, USA
March 27–28, 2000
This conference, presented by Strategic Research Institute, will bring together industry and government representatives to discuss crucial questions of coalbed and coal mine methane development and use. Topics to be addressed are reservoir assessments, news in completion technology, environmental considerations, regulation issues, and economic advantages of CBM/CMM production. The conference will present several case studies of projects in the U.S. and abroad and will offer first-hand insights in sound project development for coalbed and coal mine methane. For further information or to request a brochure, please contact Ms. Sarah Ashmore, Strategic Research Institute, by mail at 333 7*th* Avenue, 9th Floor, New York, NY 10001-5004; by phone at +1-212-967-0095, ext. 271; by fax at +1-212-967-7973 or 7974; or by e-mail at sashmore@srinstitute.com.

North American Coalbed Methane Forum
Washington, Pennsylvania, USA
May 3-4, 2000

The North American Coalbed Methane Forum will hold its Spring meeting at the Holiday Inn Meadowlands in Washington, Pennsylvania. A reception on the evening of May 3rd will precede the meeting. Technical topics will include drilling and well frac techniques, legal issues, enhanced gob gas recovery, and domestic and international project developments. Contact Kashy Aminian, Conference Coordinator, by phone at (304) 293-7682 to register or to obtain further information.

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least 150 abandoned mines, some of which will require drilling gob wells to access the methane resource. Coalgas is evaluating the extent of the commercially viable CMM resource available from these abandoned mines. As with any CBM/CMM project, the challenge is providing a reliable flow of gas to end users at an economically competitive price. To that end, Coalgas is investigating opportunities to use the CMM in a variety of applications, including green energy industrial parks and district heating. The demise of one industry in the UK, underground coal mining, may be providing the basis for the birth of another, abandoned mine CMM development.

Ukraine

With a growing need for energy in Ukraine has come a growing emphasis on energy conservation and developing alternative energy sources. As a result, interest is growing in production and use of CBM and CMM, as these are recognized as alternative fuel sources and a partial solution to regional and global atmospheric pollution problems. Underground coal mines in Ukraine's Donetsk Basin are among the world's gassiest. Ukrainian authorities estimate that 100 to 200 billion m^3 of CBM is contained in active mines, while others have estimated those reserves at ten times that amount.

The Ukrainian Alternative Fuels Center (AFC) is actively working to improve the country's CBM emissions inventory and CBM/CMM production capability. To date, approximately 100 CBM wells have been drilled in Ukraine. In a few select cases, the gas retrieved was used for local heating, pipeline injection, or automobile fuel but, for the most part, the intent for drilling those wells was for degasification purposes only. Currently, the AFC is assessing CBM/CMM drainage techniques applicable to various geologic settings in the

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Upcoming Events (cont.)

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Second International Methane Mitigation Conference
Akademgorodok (Science City)
Novosibirsk, Russia
June 18–23, 2000

This conference, cosponsored by the Russian Academy of Sciences and the U.S. EPA, aims to develop a stronger understanding of measures that can lead to the most pragmatic and cost-effective methane emission reductions. Information exchanged will include science and policy implications of various industry-specific methane control measures, costs and benefits (economic and environmental) of adopting methane controls, national and regional emission reduction strategies, and other methane mitigation topics. More than 120 presentations from 30 countries will address the coal mining, natural gas, ruminant livestock, and solid waste landfill industries. Conference organizers will offer field trips to local industry sites. For more information, contact Karl Schultz by mail at U.S. Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Avenue, NW, Mail Code 6202J, Washington, DC, USA, 20460; by phone at (202) 564-9468; by fax at (202) 565-2077; or by e-mail at schultz.karl@epa.gov. (See related article in December 1999 issue of *Coalbed Methane Extra*.)

The 2001 International Coalbed Methane Symposium
Tuscaloosa, Alabama, USA
May 14–18, 2001

The University of Alabama has announced a call for papers for its 2001 Coalbed Methane Symposium. Topical categories include international projects, resource assessment, reservoir characterization and modeling, drilling technology, and environmental and legal issues. Abstracts are due not later than June 15, 2000. For further information and to obtain a registration form, contact Ms. Gwendolyn Hood by e-mail at ghood@ccs.ua.edu.

Seventh International Mine Ventilation Congress
Krakow, Poland
June 17–22, 2001

This conference, sponsored by the Mining Committee of the Polish Academy of Sciences, will bring mining engineers, scientists, and researchers together to discuss current and emerging mine ventilation issues. In addition to technical presentations, there will be equipment and product exhibitors, and the conference will offer site visits. Conference sponsors have issued a call for papers, and abstracts are due by April 30, 2000. For more information, contact Waclaw Trutwin, Strata Mechanics Research Institute, Polish Academy of Sciences, 30-059 Krakow, ul. Reymonta 27, Poland (e-mail: trutwin@img-pan.krakow.pl), or visit the conference web site at http://www.emag.katowice.pl/IMVC.

Contact the International Coalbed Methane Centers

Visit the CMOP Web site at http://www.epa.gov/coalbed to obtain contact information for the Ukraine Alternative Fuels Center, the China Coalbed Methane Clearinghouse, and the Russian Coalbed Methane Center.

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Donbass. Part of that effort will be to evaluate industrial CBM/CMM use options in the area, with a goal of substantially increasing both methane drainage and its productive use to support Ukraine's growing energy needs in an environmentally sound manner.

Refer to the December 1999 issue of the Coalbed Methane Extra for further discussion of current CBM/CMM development initiatives in Ukraine.

Conclusion

Continuing definition of CBM reserves in coal-bearing countries and developments in gas capture and use technologies have encouraged the worldwide spread of the CBM/CMM development experience gained over the past decade in the U.S. As such activities continue, and as project economics improve, creative project developers who can effectively link gas production with viable end users will find many CMM development opportunities outside the U.S.

**Source information for this article was obtained from the Proceedings of the International Coalbed Methane Symposium, University of Alabama, Tuscaloosa, Alabama, May 3-7, 1999 and from 1998 and 1999 issues of CBM Review/ World Coal, Palladian Press, UK.*

World Bank

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With funding contributed by governments and private industry parties, the PCF funding cap will be US$150 million. The PCF funds are for investment in projects (in World Bank client countries) implementing clean technologies that reduce carbon emissions. The Bank will negotiate a price for the emission reductions that accrue, and the fund contributors will receive emission reductions certifications in return for their investment. Thus, funding and technology will flow to developing countries and economies in transition, while industrialized countries will gain carbon emission reduction credits at an attractive price. Bank officials expect that GHG reduction costs through the PCF will be on the order of US$20 per ton of carbon.

The U.S. EPA and the Russian Coalbed Methane Center have planned a possible PCF-funded project. The project, located in Russia's Kuzbass coal basin, would demonstrate the technical and economic feasibility of productively employing coalbed methane in the region, thereby reducing methane emissions by 3.23 billion m^3. The projected unit abatement costs are less than US$4 per ton of carbon. Funds would be supplied jointly by the World Bank's coal industry restructuring project, by the PCF, and by Russian sources. Project components include retrofitting coal mine and industrial boilers to burn CBM, retrofitting combined heat and power plants to cofire CBM, and distributing CBM for local residential, municipal, industrial, and other uses.

> The PCF offers a tangible incentive for verifiable GHG reduction projects.

Because CMM mitigation should easily meet criteria being developed to define eligible projects, the PCF will constitute an alternative financing source for coal mine methane projects in developing countries.

To keep abreast of the PCF's participants and activities, visit its Web site (http://www.prototypecarbonfund.org). Also, for support in developing CMM projects internationally, contact the U.S. EPA Coalbed Methane Outreach Program or the International Coalbed Methane Centers.

U.S. EPA Changes Mailing Address

The U.S. Environmental Protection Agency has changed its headquarters mailing address (delivery addresses remain unchanged). Therefore, please address future written correspondence with CMOP to:

U.S. Environmental Protection Agency
Coalbed Methane Outreach Program, 6202J
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Coal Mine Methane Project Nets Carbon Credits

Northwest Fuel Development, Inc. will receive US$1million to fund electricity generation projects using coal mine methane (CMM). The Klamath Cogeneration Project, a 500-mega-watt combined-cycle gas-fired power plant, will supply the funds to obtain the carbon offsets that will result from productively using CMM.

Beginning at Cadiz, Ohio, Northwest Fuel will expand an existing project that captures and combusts CMM from an abandoned underground coal mine to generate electricity for sale to an active mine. Other similar projects will follow. In all, the Northwest Fuel projects will offset 4.5 million tons of CO_2 over a 50-year period. Because the methane that will fuel electricity generation otherwise would be vented to the atmosphere, these projects will generate carbon credits that the Klamath Cogeneration Project will add to its carbon offset portfolio. The portfolio of carbon offsets will balance the CO_2 releases that will result when the new cogeneration plant comes on line.

> Northwest Fuel will receive US$1 million to offset 4.5 million tons of carbon over a 50-year period.

Northwest Fuel is a U.S. firm that builds and operates commercial electric power generation plants fueled by low-quality, waste CMM. By applying relatively low-tech means for generating electricity from CMM, Northwest Fuel's power projects can be very cost effective. In fact, at US$0.22 per ton of CO_2, the Northwest Fuel projects will provide the Klamath Cogeneration Project with its least expensive carbon offset option.

The Klamath Cogeneration Project is a joint venture of PacifiCorp Power Marketing, Inc. and the City of Klamath Falls, Oregon. With a total carbon offset portfolio amounting to US$5.5 million, the Northwest Fuel carbon credit purchase constitutes a substantial component of the cogeneration project's overall carbon offset strategy.

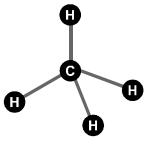
Reductions In Coal Mine Methane Emissions Continue

The U.S. Department of Energy, Energy Information Administration's (EIA) Voluntary Reporting of Greenhouse Gases Program* included submissions from 11 projects that reduced greenhouse gas (GHG) emissions from coal mining in 1998. Those projects mitigated the release of 817,859 metric tons of coal mine methane (17,175,016 metric tons carbon dioxide equivalent), which equates with approximately 80 percent of all methane recovered from U.S. mines that year.

The 1998 data revealed that of the 11 coal mine methane projects, seven reported an affiliation with the U.S. Environmental Protection Agency's voluntary Coalbed Methane Outreach Program, an increase of six from 1997.

{Note that the deadline for submitting to EIA 1999 data on emissions reductions and carbon sequestration is June 1, 2000.}

* *Voluntary Reporting of Greenhouse Gases - 1998, DOE/EIA-0608(98), available at http://wweia.doe.gov/oiaf/1605/vrrpt/index.html.*



New Coalbed Methane Extra Distribution System

As of the June 2000 issue, the Coalbed Methane Extra will be distributed by e-mail only!
Be sure that we have your current e-mail address!

To date the Coalbed Methane Extra has been distributed in the U.S. and abroad via fax. However, our experience with the fax approach has been less than ideal, with fax numbers often changing and the visual quality of the faxed document being variable, depending on the level of fax technology at the receiver's end. Therefore, beginning with the June 2000 issue we will cease fax distribution of the Extra and it will become an exclusively e-mailed product.

CMOP can only assure that your receipt of the *Extra* will continue uninterrupted if we have your current e-mail address! Please take a moment to e-mail CMOP at fernandez.roger@epa.gov to confirm or to supply your current e-mail address. In the future, please submit changes to your e-mail address to CMOP so that you will not miss a single issue of the *Extra.*