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COALBED METHANE EXTRA

A publication of the Coalbed Methane Outreach Program (CMOP)

www.epa.gov/coalbed

In this issue

To obtain CMOP reports, call 1-888-STAR-YES. Access documents electronically from the "Document Download" pages on our World Wide Web site at www.epa.gov/coalbed.

Visit U.S. EPA's recently created bulletin board to post and share information on methane mitigation efforts at www.ergweb.com/methane.

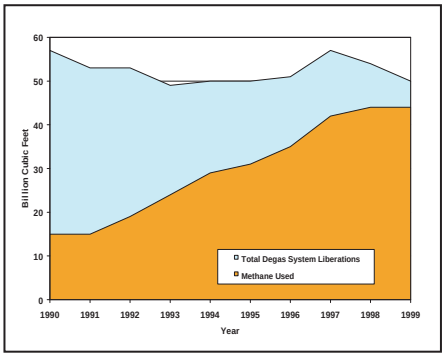
To subscribe to CBM Notes email a subscription request to energystar@optimuscorp.com with the word "SUBSCRIBE" in the subject box.

CMM: A Decade of Progress

The 1990s witnessed dramatic growth in the capture and utilization of coal mine methane (CMM). In 1990, coal mines captured and utilized only 25% [15 billion cubic feet (Bcf)] of the methane produced from their degasification systems, compared to over 85% (43 Bcf) in 1999 - - a nearly 300% increase in ten years. To put these figures into perspective, this is the equivalent of removing the emissions from 2.5 million cars from the road during the decade!

Perhaps more interesting than the quantity of the emissions reductions is that these reductions were achieved through direct, voluntary actions taken by the coal industry, as opposed to government regulation. Over the decade, total CMM emissions fell 65 Bcf, from 218 Bcf in 1990 to 153 Bcf in 1999, a 30% reduction. Of this 65 Bcf, just over two-thirds, or 43 Bcf, is attributable to active CMM degasification and utilization projects implemented by the coal industry. In terms of CO2, this represents the equivalent of 492 million tons of CO2 emissions avoided over the period 1990 through 1999.

(Continued on Page 6)



The Amount of CMM Utilized Over the Past Decade Has Increased 300%.

EPA Launches "Coalbed Methane Notes"

The Coalbed Methane Outreach Program is offering a new weekly email service. Called Coalbed Methane Notes, the Program will provide updates on industry and program activities, information you can use on project opportunities, technical advances, financing mechanisms, and business contacts.

Future editions will feature useful hotlinks to energy and environment websites, updates on the greenhouse gas emissions market, upcoming events, country market and activity updates for China, Russia, and Ukraine, and several technology features.

Notes is only being disseminated to those who email a subscription request to energystar@optimuscorp.com. If interested, simply send a message with the word "SUBSCRIBE" in the subject box. We are interested in feedback on this service and welcome ideas for upcoming Notes.

Industry News

DOE Funds Three CMM Capture and Utilization Projects

The National Energy Technology Laboratory (NETL), the U.S. Department of Energy's (DOE) field office for fossil energy research, recently selected three projects that seek to develop innovative technologies to capture and utilize CMM (www.netl.doe.gov/index-b.html). The three projects are:

Address inquiries about Coalbed Methane Extra contents or about the US EPA Coalbed Methane Outreach Program to:

Karl Schultz -
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E-mail: schultz.karl@epa.gov
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Our mailing address is:
U.S. Environmental Protection Agency,
Coalbed Methane Outreach Program, 6202J
Ariel Rios Building
1200 Pennsylvania Ave., NW
Washington, DC 20460

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

Appalachian-Pacific Coal Mine Methane Power Co., LLC, Arlington, Va., will work with West Virginia University Research Corp., Invitation Energy, and Chart Industries (Denver) to convert CMM from mines in West Virginia into liquefied natural gas (LNG) to fuel heavy trucks. Company Contact: Charles D. Estes, 703-526-7851 or charles.estes @ gastechnology.org.

500 Gallon/Day TASHER LNG Plant.
Photo courtesy of Appalachian-Pacific / Chart Industries.

Northwest Fuel Development, Inc., (www.north westfuel.com) Lake Oswego, OR, will build and demonstrate an integrated gas-processing/ power-generation system at a West Virginia coal mine. Company Contact: Peet M. Soot, 503-699-9836.

Fuel Cell Energy, Inc., (www.fuelcell energy.com) Danbury, CT, will field test a fuel cell power plant utilizing CMM emissions from a mine in Cadiz, Ohio. Company Contact: George Steinfeld, 203-825-6122 or gsteinfeld @fce.com.

FuelCell Energy's 250 kW Power Plant.
Image courtesy of FuelCell.

For additional technical information, please contact William Haslebacher with NETL at 304-285-5435 or via e-mail at whasle @netl.doe.gov.

New Engine to Utilize CMM

RAMGEN Power Systems, Inc., of Bellevue, Washington, will test a version of their Brayton cycle based power generation system at Jim Walters Resources' mines in Alabama to produce power from CMM released from their ventilation system. In the engine design, a single, high-speed rotating disk replaces the conventional multi-stage compressor, combustor, and turbine to produce power.

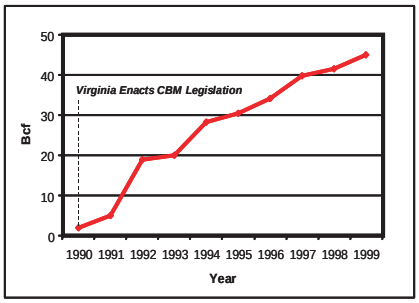
RAMGEN will also develop a pre-prototype version of their existing Mach 2 engine currently being tested in Tacoma, Washington. The $3.1 million Tacoma prototype project is scheduled to last eight months. For more information, please contact Glenn Smith of RAMGEN at 425-828-4919.

(Industry News continued on Page 3)

Industry News (continued from page 2)

Paper Addresses CMM/CBM Ownership Issues in Pennsylvania

Uncertainty surrounding the ownership of CMM/CBM rights is still a major impediment to CMM/CBM development in several Appalachian Basin states. As demonstrated in Virginia, the resolution of ownership issues can lead to rapid growth in CMM/CBM development - - CMM/CBM production in the state jumped to 6 Bcf in 1992 from less than 1 Bcf in 1990 due at least in part to CMM/CBM legislation enacted by the state in late 1990 (see EPA report entitled "Coalbed Methane Legislation and Recovery in Alabama, Pennsylvania, Virginia and West Virginia" found at www.epa.gov/coalbed).



Virginia Coalbed Methane Production: 1990-2000

A recent paper by Kathy Flaherty in the Journal of Natural Resources and Environmental Law (Vol. 15: No.1) reviews the major legal cases concerning CMM/CBM ownership and provides suggestions to promote the development of CMM/CBM in Pennsylvania. Flaherty suggests that coal owners could identify a gas operator and jointly obtain a lease from the surface owner to conduct drilling operations. The wells would initially be drilled to degasify the mine and after mining would be turned over to the gas operator for maintenance and production. This approach would eliminate inconsistencies and resolve conflicting laws regulating the oil, gas and mining industries in Pennsylvania. Ms. Flaherty can be reach via e-mail at kjflaherty@dellnet.com.

International News

U.K. Forms CMM Association

Several companies in the United Kingdom recently formed the Association of Coal Mine Methane Operators to promote the development of CMM. The association believes that CMM should qualify for "green" status under the U.K.'s Renewable Energy Obligation and be exempt from the Climate Change Levy (CCL) when used for distributed electricity generation.

Alkane's Shirebrook Plant.

Cameron Davies of Alkane Energy (www.alkane.co.uk) is the Chairman of the ad hoc association that is currently comprised of nine companies, including several large utilities who will be end-users for the gas. For more information contact Cameron Davies at cdavies@alkane.co.uk.

Texaco and CUCBM Sign Contract for New CBM Projects

Texaco (www.texaco.com) recently announced that it signed three contracts with the China United Coalbed Methane Corporation, Ltd. (CUCBM) to expand Texaco's CBM program into China's Ordos Basin. The contracts include an appraisal program to be carried out by Texaco over three prospective blocks, Zhungeer, Shenfu, and Baode, located along the Yellow River and stretching across the borders of Shaanxi and Shanxi provinces and the Inner Mongolia Autonomous region.

Robert Solberg, president of Texaco Worldwide Upstream Commercial Development, said, "The development of China's CBM reserves for fuel is an important component of the country's energy and environmental development plan. Texaco is pleased to help develop a resource which complements our global energy development strategies and strengthens our long-standing business relationships with China."

(Int'l News continued on Page 4)

International News (continued from page 3)

China CMM Market Development Project Update: Workshop Attracts International Interest

The International Workshop on Opportunities for Coal Mine Methane Projects, held in Beijing China on 20 and 21 September 2000, attracted a diverse group of industry and government personnel interested in CMM development. Twenty-six speakers presented talks in four sessions. Key topics presented included the importance of CMM and CBM as components in China's plan to develop clean fuels, opportunities and finance mechanisms for developing CMM/CBM projects in China, technology advances, and presentation of the Jingcheng CMM data package.

Attendees of the Beijing Meeting. Photo courtesy of China Coalbed Methane Clearinghouse.

The workshop was part of China Coal Mine Methane Market Development Project, a joint project between the China State Administration of Coal Industry (SACI) and U.S. EPA. Its goal is to increase recovery of CMM by working with industry to identify and market promising projects. The focus of this effort is the preparation and marketing of detailed data packages describing project opportunities at selected coal mining administrations (CMAs).

A key component of the Market Development Project is the China Business Advisory Committee (BAC), formed in October 1999 to help achieve the project's goals by fostering a market-driven approach to coalbed methane development. Participants in the BAC include energy exploration, development and consulting firms, equipment manufacturers and vendors, and companies from the U.S. and other nations with an interest in effecting GHG reductions. BAC members have the opportunity to help Chinese coal companies identify the types of technical and economic information potential investors expect to see in order to review a prospect. In the course of providing this assistance, BAC members have a first-hand opportunity to review information on specific prospects, and make contacts that increase their potential to make business alliances.

The CBMC is now finalizing the first data package. It concerns project opportunities at the Jincheng CMA, and will be disseminated to potential investors and other interested parties. Data gathering and analysis of project potential at Huaibei and other CMAs is continuing, and the China Coalbed Methane Clearinghouse and EPA will work with these CMAs to prepare and market data packages. In April 2001 Chinese coal companies, the SACI and EPA will meet in China to focus on marketing CMM projects at Jincheng, Huaibei, and other CMAs. A final project meeting is scheduled for October 2001 in Beijing. The October meeting will provide an excellent opportunity for all those interested in CMM in China to review data packages on specific project opportunities, and discuss these opportunities in detail with Chinese coal mine and government officials.

Workshop proceedings are available on the internet at www.coalinfo.net.cn/eng.htm. For more information regarding the workshop, please contact Mr. Ray Pilcher at Ravenridge Resources at pilcher@ravenridge.com or contact the China Coalbed Methane Clearinghouse at cbmc@public.bta.net.cn.

(Int'l News continued on page 5)

Russia to Submit Proposal for $10 Million UNDP/GEF Grant for CMM Development

The development of Russia's enormous CMM resources may soon take a great stride forward under an upcoming proposal to the U.N. Development Program (www.undp.org) / Global Environmental Facility (www.gefweb.org) (UNDP/GEF). The project will seek to promote the recovery and utilization of CMM in the Kuznetsk coal basin by removing technical, financial, and greenhouse gas accounting barriers. Three pilot projects with the potential to reduce up to 7 MMTCE of methane over 15 years will also be implemented. The 4-year net project cost is currently assessed at $15 million, with about one-third of this sum covered by Russian coal mine companies and private and public investors (U.S. EPA will also provide assistance to help advance the project). In addition to substantial emission reduction and barrier removal, the project benefits include increased efficiency and safety of coal production and an alternative source of clean energy in the form of CMM. Over its 15-year lifetime, the project is expected to recover all its initial costs and even generate a few million dollars in net profit. Beyond that, the project is expected to stimulate an additional $15 to $20 million of private and public investment in CMM recovery and utilization. The anticipated starting date for the project is September, 2001.

Russian CMM/CBM Training Completed

Well testing and analysis training for the Russian Coalbed Methane Center in Kemerovo was completed in late November. The Center now has the equipment and technical expertise to cost-effectively assess key CBM/CMM reservoir parameters (e.g., gas content, permeability, in-situ stress). The training course, sponsored by U.S. EPA, was conducted by Scott Reeves of Advanced Resources International. As part of the training, test operations were conducted in a well in the southern Kuzbass basin. Two coal seams were tested with a combined thickness of 18 feet over a 100 foot interval. The testing included a slug test and an injection/falloff test. All of the U.S. purchased equipment (e.g., gauge, packer system, data logger, etc.) was run successfully and performed well in the field. Results indicated a permeability to water between 1 and 4 millidarcies. In addition to the testing, a business plan was developed to help commercialize the Kemerovo Center services. Companies interested in utilizing the Center's services should contact Oleg Tailakov at tailakov@mail.stanet.ru.

Lowering the Downhole Testing String.

Coal Mine Methane Emissions in Poland Discussed

On November 6-7, a workshop in Warsaw, Poland convened to discuss greenhouse gas emission estimation, particularly for methane emissions from coal mining. The workshop allowed Polish participants to present the results of their efforts and to hear U.S. perspectives on greenhouse gas inventory development.

The Poles concentrated on enhancing the inventory's estimates of fugitive methane emissions from coal mining, since coal mining is a large sector of the economy and represents over 20 percent of methane emissions. Lidia Gawlik of the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences and Ireneusz Grzybek of the Polish State Mining Authority in Katowice reported on the results. There have been important changes since Poland last calculated its emission factors for coal in 1992. Several mines have closed, and the coal currently extracted comes from less gassy mines, resulting in a need for revised emission factors. The Polish team modified the emission factors developed in 1992, including adjusting the factors to reflect the layers of the mine that are actually exploited. The use of improved factors results in a 2% decrease in 1998 emissions, to 613 Tg of methane emitted, and a decline of over 20% in methane emissions from coal mining since 1990. The team also estimated the uncertainty associated with each mining-related activity and assessed the availability of key statistical data. They also provided recommendations for further improvements in the inventory methodology, including revising some calculations and updating reporting requirements to allow for more accurate data.

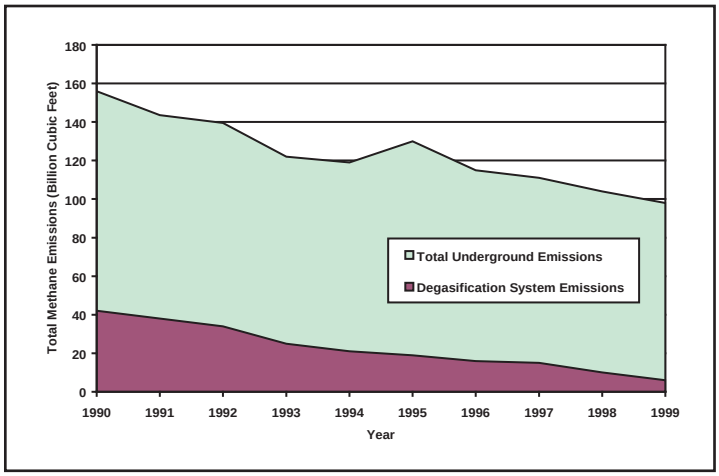
A presentation by Elizabeth Scheehle (scheehle.elizabeth@epamail.epa.gov) of the U.S. EPA discussed the methodologies used in the U.S. to estimate methane emissions and reductions from coal mining. Emphasis was placed on the importance of mine-specific measurement values, especially for the gassiest underground mines. Information on methane emissions from coal mining in the U.S., part of the annual Inventory, is available at: www.epa.gov/globalwarming/publications. Information on methane emissions can also be found at: www.epa.gov/ghginfo.

CMM: A Decade of Progress

(continued from Page 1)

Working together, industry and government have made great strides over the past decade to reduce CMM emissions. EPA's Coalbed Methane Outreach Program will continue to work with industry in this first decade of the new millennium to advance on this progress, focusing on profitably reducing methane emissions from the key remaining sources.

- ***Ventilation Air Methane (VAM)*** is the greatest source of emissions; in 1999, VAM emissions totaled 92 Bcf which accounted for 94% of the remaining emissions from underground coal mines. EPA is working with developers and coal operators to demonstrate and deploy technologies that can reduce these emissions over the next few years. Preliminary work shows that the global market is large, and that over 100 million tons of CO2 equivalent may be profitably reduced each year.



VAM Emissions are the Key Remaining Source to Address

- ***Flaring***. Reducing emissions of the relatively small amount of methane still vented from degasification systems (about 6 Bcf) is another priority for EPA. For while the majority of high quality gas is marketed, much of the remaining medium quality gas does not have a ready market. Flaring represents one promising option for destroying the methane in this gas stream. EPA will continue working with coal operators and safety authorities to develop flaring technology and demonstration projects.

- ***International technology transfer,*** using lessons learned in the U.S. will be important for achieving global reductions in CMM emissions. Some countries have already embarked on CMM programs and have realized benefits in a relatively short period of time. EPA has worked in several key countries such as China, Russia, and Ukraine with in-country experts and will continue to make certain that lessons learned in the U.S. may be applied globally.

- ***Emissions Credit Trading*** is an emerging mechanism for financing CMM projects, but the trading system has yet to be formalized. EPA will continue to track this growing market and provide information on project opportunities to emissions credit buyers, brokers, and project developers.

Karl Schultz, Team Leader for EPA's Coalbed Methane Outreach Program is optimistic about the future to reduce methane emissions from coal mines, stating that "Industry has the potential to reduce its methane emissions significantly and voluntarily, especially if leaders in the coal industry are innovative and exploit new technical options and revenue streams such as emissions credit trading. The CMOP looks forward to continued collaboration with industry to achieve this potential."

Milestones in U.S. CMM/CBM Development: 1990 - 2000

More Than 75% of CMM From Degasificiation Systems is Vented to the Atmosphere.

1990
- EPA Begins Outreach to Industry.
- "Virginia State Oil and Gas Act" Clarifies CMM/CBM Ownership Issues.

1991

1992
- CONSOL Constructs Pipeline to Connect Their Deep, Gassy Mine in Virginia to the Interstate Network.
- EPACT Requires States to Resolve CBM Ownership Rights by 1995 or Become Subject to Federal Regulations.
- Framework Convention on Climate Change (FCCC).
- Section 29 Tax Credit Expires for Newly Drilled Wells.

1993
- FERC Order 636 Provides Open Access for Producers to Interstate Pipelines.
- Federal #2 Mine Begins Selling Gas.
- Climate Change Action Plan (CCAP).

1994
- West Virginia Creates Guidelines for CMM/CBM Development.
- EPA Establishes the Coalbed Methane Outreach Program.
- USX's Pinnacle Mine Gas Production Starts.

1995
- DOE Creates the CMM Development and Demonstration Program.
- CONSOL Begins Using CBM for Coal Drying at its VA Mines.

1996
- Northwest Fuel Starts Producing Power at Nelms Mine, Ohio.

1997
- CDX Gas Starts Selling Gas from the Blacksville 2, Humphrey 7, and Loveridge 22 Mines.
- CONSOL and Northwest Fuel Conduct PSA Demos for Upgrading Gob Gas.

1998
- BCCK Installs and Operates Cryogenic Upgrade System.
- CONSOL Installs Additional Pipeline Capacity.
- Pinnate Drilling Methane Pioneered by CDX Gas at Pinnacle Mine.

1999
- U.S. Supreme Court Rules in *Amoco v. S. Ute Indian Tribe* that CBM Rights are Separate from Coal Rights on Federal Lands.
- MEGTEC and CANMET Demonstrate Flow-Reversal Reactors to Combust VAM.

2000
- Jim Walters Resources Acquires BCCK Cryogenic Gas Upgrading System.

More than 85% of CMM From Degasification Systems is Captured and Utilized - - a 300% Increase in 10 Years!

Hansen Article Presents Alternative Scenarios for Climate Change Actions

Last August, Dr. James Hansen, Director of NASA's Goddard Institute for Space Studies, published a paper in the Proceedings of the National Academy of Sciences (www.pnas.org) entitled "Global Warming in the 21st Century: An Alternative Scenario." This important paper has sparked a great deal of discussion among the academic, policy, industry, and NGO communities. A number of articles and editorials followed the publication of Dr. Hansen's paper, many of which misrepresented its premise and conclusions. This article provides a brief overview of the Hansen paper. For a more detailed account, see Dr. Hansen's clarification and discussion of the various media accounts of his paper (www.giss.nasa.gov/research/impacts/altscenario/discussion.html).

In his paper, Hansen provides a framework – an "alternative scenario" – for assessing the options to limit future climate change. He points out the critical role that reductions in methane and soot emissions, more important in driving climate change than most scientists and policy-makers recognize, can play in reducing future climate change. He also reinforces the importance of reducing CO2 emissions.

To date, greenhouse gas emissions from human activities have caused a climate forcing of more than two Watts per square meter, or, as Hansen describes it, "the gases that people have added to that atmosphere cause a heating of the Earth's surface as if two miniature one-Watt Christmas tree bulbs had been placed over every square meter of the Earth's surface" [from clarification]. Most climate modelers use "Business as Usual" (BAU) scenarios for future climate forcing that project an additional forcing of about three Watts/square meter by 2050 from human


Global Warming in the Twenty-First Century:
An Alternative Scenario

activities. The BAU scenarios project a large increase in global temperature by 2100 and "can give the impression that curtailment of global warming is almost hopeless" (pnas article, p1).

In his paper, Hansen presents an alternative to these the BAU scenarios projections under which the additional forcing in 2050 is held to 1 Watt/square meter. The actions envisioned under Hansen's alternative scenario include stabilizing CO2 emissions at current levels, reducing methane emissions by about 30%, and reducing soot and other non-CO2 greenhouse gas emissions. One of the key misinterpretations of Hansen's paper is that he is recommending we shift focus from CO2 reductions to the non-CO2 greenhouse gases. In fact, a critical component of Hansen's scenario is considerable attention to CO2 emissions in order to keep the rate of growth in the atmospheric concentration of CO2 to the level seen since 1980. What this means in terms of emissions is that CO2 from fossil fuel use must decline slightly or at minimum not increase – certainly requiring increased energy efficiency and possibly other measures as well.

Reducing methane emissions by 30% globally is a significant challenge. But, as Hansen points out, there are many opportunities to reduce methane emissions from human activities, often cost-effectively, with additional benefits including reduction in tropospheric ozone, which is harmful to human health and agriculture. He specifically mentions CMM, stating that methane "escaping from landfills, coal mining and oil drilling sites . . . can be reduced or captured, with economic benefits that partially or totally offset the costs" (pnas, p. 5). As described in the accompanying article, the CMM industry avoided over 40 Bcf of methane emissions in 2000 in the U.S. alone, up from virtually zero in the mid-1980s. The tremendous increase in CMM recovery and use over the past decade – in most cases for economic reasons – demonstrates that Hansen's "alternative scenario" for 2050 is possible, particularly with continued government/industry collaboration and an ongoing attention to the potential of methane and other non-CO2 gases to help address global warming.

Upcoming Events

2nd Annual Coalbed and Coal Mine Methane Conference- Meeting the Energy Needs of a New Century
CBM Conference
Denver, Colorado
March 27-28, 2001

This annual conference, presented by the 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, regulations issues, and economic advantages of CBM/CMM production. The conference will present several case studies of projects in the U.S. and abroad, and also offer first-hand insights in sound project development for coalbed and coal mine methane. The chairman of the conference will be Ray Pilcher, President of Raven Ridge Resources, Inc. The senior panel of speakers will include representatives of the U.S. Environmental Protection Agency, Octagon Energy, U.S. Geological Survey, U.S. Department of Energy, Interstate Oil and Gas Compact Commission , and the Gas Technology Institute. For further information or to request a brochure, please contact Heidi Aigler, Strategic Research Institute, by mail at 333 7th Avenue, 9th Floor, New York, NY 10001-5004; by phone at 212-967-0095, ext. 271; by fax at 212-967-7973 or 7974, or by email at haigler@srinstitute.com .

Investment Opportunities in Coalbed Methane
The Hatton, London
March 28-29, 2001

This conference will discuss why CBM offers a growing opportunity for investors by examining how it can be effectively commercially exploited. The conference will focus on identifying new opportunities for using CBM/CMM and examine new and existing technologies for extracting and utilizing CBM/CMM from unmined, mined, and abandoned coal seams. For more information, please contact Mr. Mark Butterworth of SMI at +44 20 7827 6774 or via e-mail at mbutterworth @smi-online.co.uk. You may also register online by visiting SMI's website http://www.smi-online.co.uk/ coalbedmethane3.asp or call + 44 (0) 20 7827 6134.

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

The University of Alalbama will host the 2001 Coalbed Methane Symposium this coming May. Topics to be addressed include international projects, resource assessment, reservoir characterization and modeling, drilling technology, and legal and regulatory issues.

In conjunction with the meeting, EPA will be hosting a workshop on International Opportunities in CMM. The workshop has been presented at the last several symposiums and has proven to be a popular event. 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, equipment and product exhibitors will be present, and there will be site visit opportunities. 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 website at www.emag.katowice.pl/IMVC.