

CHINA TURNS TO NEW TECHNOLOGIES TO REDUCE POLLUTION, IMPROVE MINE SAFETY

Summary: China's coal industry suffers from mining deaths. It is the world's largest contributor of air pollution and global warming. China is taking action fast to remedy the problems and make the country more environmentally sound. Companies from Canada, Australia and the United States bring their new technologies to China. Coal bed methane gas exploration may help offer one solution to reducing polluting emissions from China's coal mines and reduce mine explosions, which cause an alarming number of coal worker deaths.

Part Two of a Two Part Series



Smoke Stack from a Coal Fired Plant. Coal combustion produces 100 million tons of ash byproducts, such as bottom ash.

By James Finch

China is the world's largest producer and consumer of coal. The country also holds 13 percent of the world's recoverable reserves. Last week, China's National Development and Reform Commission (NDRC) reported the country's coal output jumped by 8 percent to 2.11 billion tons in 2005. The U.S. Energy Information Administration Outlook 2005 projected China's coal consumption would grow to 1.81 billion tons by 2015, about one-quarter of the world's total consumption of coal. Nearly half the coal expected to be consumed in Asia over the next decade will be burned in China. In 2002, the industrial sector consumed about 47 percent of that coal. As the world's leading producer of both steel and pig iron, China needs

fuel to meet the world's eager appetite. Together with India, these two countries will represent 71 percent of the forecasted growth in coal consumption over the next decade.

China's dependence upon coal comes at a price. The NDRC reported nearly 6,000 died in coal mining accidents in 2005. The World Bank estimates about 400,000 Chinese die each year from air pollution-related illnesses, mainly heart and lung diseases. Not only does China export 24 percent of its coal to other Asian countries, it is exporting its pollution from coal emissions. "As much as 40 percent of air pollution in Japan and South Korea originates from China," said Dan Millison, an environment and energy specialist for the Asian Development Bank. Boo Kyung-Jin of the Korea Energy Economics Institute said, "South Koreans are increasingly con-

Coal Consumption in China by Sector, 2002, 2015, and 2025



Sources: 2002: Derived from Energy Information Administration (EIA), *International Energy Annual 2002*, DOE/EIA-0219(2002) (Washington, DC, March 2004), web site www.eia.doe.gov/iea/. 2015 and 2025: EIA, System for the Analysis of Global Energy Markets (2005).

World Coal Consumption by Region, 1980, 2002, 2015, and 2025



Sources: 1980 and 2002: Energy Information Administration (EIA), *International Energy Annual 2002*, DOE/EIA-0219(2002) (Washington, DC, March 2004), web site www.eia.doe.gov/iea/. 2015 and 2025: EIA, System for the Analysis of Global Energy Markets (2005).

cerned. In spring, everybody is coughing. It is getting worse in recent years." A report in Channel NewsAsia suggested, "There is also growing evidence that the pollution has reached North America.

New Technology to Speed up Alternative Solutions

In Part One, we discussed coal bed methane as a potentially 'minimizing technology.' By degassing China's coal mines, many of the gas explosions at China's coal mines can be reduced. Coal bed methane is actually methane gas present in coal seams. This is the gas that threatens the lives of miners working in underground mines. China emits 6 billion cubic feet of methane gas annually from its mines. Methane gas is released into the atmosphere, from working mines, abandoned mines and through the exhaust system of mines, leading to emission of a greenhouse gas. By releasing the methane trapped inside virgin coal seams, it could instead be captured and used as an energy source.

"There are on the order of 800 basins in the world with coal in them," explained Dr. David Marchioni, who was also interviewed in Part One of this report. "There are probably still only about 30 or 40 producing coal bed methane areas." The pre-eminent coal bed methane (CBM) geologist, who is also overseeing the CBM exploration by Pacific Asia China Energy (TSX: PCE) in China, added, "They haven't all been looked at, but a lot of them have." New CBM drilling technology, which China has been openly soliciting for the past four years, may help resolve some part of the pollution and mine fatality issues.

China United Coal Bed Methane Company (CUCBM) President Sun Maoyuan believes the expansion of China's coal bed methane industry may help reduce the high incidence of coal mine accidents. Sun said, "Development of this resource has great strategic significance for China, as it could help narrow the growing energy supply and demand gap, while reducing environmental pollution in the country." According to the US Energy Information Administration, overall natural gas consumption in China is projected to grow at an average annual rate of 7.8 percent, from 1.2 trillion cubic feet

in 2002 to 6.5 trillion cubic feet in 2025 - a jump of more than 500 percent. Every available method, including CBM development will be necessary to help meet that forecast.

The Xinhua news agency announced in March 2002 it was partnering with a Canadian executive agency help develop China's CBM resources. The Canadian group included the Canada Alberta Research Council, the Canada Computer Modeling Group Ltd, and Sproule International. The project aimed to effectively exploit the coal bed methane gas using Canada's advanced technology. The 19th CBM concession awarded by China United Coalbed Methane Co (CUCBM) was announced in March 2004 through a news release issued by the Embassy of the People's Republic of China in New York. The 150.8 square kilometer CMB concession had estimated gas reserves of 30 billion cubic meters. What was noteworthy was this mention far down in the press release, "According to the contract signed with CUCBM, Sino-American Energy, which specializes in the exploration, development and production of coalbed methane resources, will introduce its advanced horizontal well technology for pilot development in China."

China is eager to exploit its resources, lower its pollution standards and reduce the number of mine fatalities. However, technology is what will move China into major superpower status before 2050. CUCBM was granted "favorable policies," not often awarded when dealing with foreign investors. Such include tax reduction, duty exemption and independence in investment and the same for their import and export decisions. In other words, free market pricing. China needs energy and will move mountains to get it. China is also developing its relationship with Canada. After the United States, China is Canada's largest trading partner. In late January 2005, the largest ever trade mission led by a trade minister took place in Shanghai, Beijing and Hong Kong between Canadian and Chinese companies with over 370 Canadian delegates from 279 companies participating. More than 100 agreements were signed between those countries' leading companies. ([Details of agreements signed](#))



Chinese Premier Wen Jiabao, "The development of coal bed methane exploration and production can not only prevent gas explosions in the collieries, but also help diversify the energy consumption mix, and we should intensify efforts to research, explore and utilize coal bed methane resources."

[can be found here.](#)) China is hungry for Canadian technology while Canada is eager to strengthen its ties with the world's next major superpower.

Dr. Marchioni, who is also a director of Pacific Asia China Energy (PACE), strongly endorsed his company's relationship with CUCBM, "They are your partners so it is to their benefit to make sure that things happen. They assist us in negotiating with the provincial coal bureaus." But PACE is carrying the project through the initial exploration. What does CUCBM bring to the table for their share? Marchioni shot back, "We have access to quite an abundance of coal exploration data before we even start drilling. That was provided by the regional coal group. CUCBM aided and assisted in that negotiation. Where's the government interference one might expect? "It's that committee's job to get the project done," Marchioni explained. "It's one of the benefits in having CUCBM as a partner because they have a vested interest in it. These people are bureaucrats within the organization within the govt. The success of our project would shine very nicely upon them, because they are part of the committee and part of the operation."

To date, PACE has been granted two CBM concessions by CUCBM. One of those concessions is about one-half the size of Rhode Island. Sproule International, which was part of the initial Canadian executive group that partnered with CUCBM in 2002, reviewed PACE's CBM 970-square-kilometer concession in the Boatian-Qingshan property in the Guizhou Province of China. For those unfamiliar with China, it's sometimes called the "Home of Coal in South China," and the region is reportedly China's second largest coal producer. The highly regarded Sproule research team, among Canada's leading specialists in evaluating coal bed methane projects, published an independent technical report announcing the concession may contain up to 11.2 trillion cubic feet of gas. A "most likely scenario" would be production capacity up to slightly more than 5.2 trillion cubic feet. By comparison, other CBM concession blocks, which we reviewed, announced CBM gas resources on the order of 30 billion to 150 billion cubic feet.

Other Canadian CBM exploration companies have also been awarded CUCBM concessions. Verona Development Corporation

(TSX: VDC) followed in the footsteps of Pacific Asia China Energy in late November 2005 when CUCBM awarded the company its 23rd concession. Verona's 1015-square kilometer concession in northern Shilou may hold about 150 billion cubic meters of gas. Earlier this month, CUCBM signed a production sharing contract with Ivana Ventures Inc (TSX: ANA) in Suzhou of east China's Anhui province. Ivana's goal is to confirm Chinese estimates of more than 3.3 trillion cubic feet of gas on the 856-square kilometer concession.

Mitchell Drilling's Dymaxion Technology Opens Doors



The Dymaxion SIS drilling system being used.

Why the preferential treatment for Pacific Asia China Energy? True, it was the first Canadian publicly traded company to be awarded a CBM concession. Now they have two. Perhaps these valuable CBM concessions might have something to do with PACE's recent announcement of a joint venture with Mitchell Drilling Contractors (MDC) of Australia. All companies who wish to use MDC's proprietary drilling technology in China must make arrangements with the MDC-PACE joint venture company. A February 6th news release issued by Pacific Asia China Energy, announced,

The Joint Venture company will have the exclusive license to use Mitchell's proprietary drilling Dymaxion System in China. Dymaxion is a unique and highly effective surface to in-seam drilling technique which the company has deployed since early 2000. To date, over 200 Dymaxion wells have been drilled on CBM projects.

What makes Mitchell Drilling special? "They've developed things as simply as possible, as inexpensively as possible, as efficiently as possible," Dr. Marchioni pointed out. "They are doing things probably at half the cost of what it might cost in Alberta. They've developed some unique approaches into how they drill their wells." Because they keep everything light, everything is simple. "Efficient, less expensive, more portable - most of their work is done with truck-mounted rigs," Marchioni added. "They have fewer people on their well sites, mainly because of the small equipment."

StockInterview.com looked into Mitchell Drilling. Started in 1969 when founder Peter Mitchell bought his first drill rig for \$11,500 at a repossession sale, the company has become Australia's



A coal bed methane project in Shanxi, China.



Typical MGP Stratigraphic Section and Well Layout

largest privately owned drilling company. Mitchell Drilling became involved in minerals exploration in 1971. Over the past thirty-seven years, the drilling company has contracted to nearly every major exploration company, drilling for oil, uranium, gas and coal reserves throughout the key mining states of Australia. With more than 150 staff, including some of Australia's top engineers and geologists, the company has since expanded outside of Australia. "Originally, we wanted to bring them over to work for us," Marchioni told us. "The more we talked to them, the more they got interested in China, and the more excited they got about it." Not a bad partner to have in a country which does a lot of business with China.

Why are CBM geologists excited about the Dymaxion drilling technology? They have one of the highest success rates in this type of drilling," said Steven Khan, executive vice president of Pacific Asia China Energy. "While there are other companies who have successful horizontal drilling techniques, they provide a service more successful and at significantly lower cost." While horizontal drilling is the nature of the beast in CBM drilling, MDC's Dymaxion surface to in-seam (SIS) technique is different, hence its proprietary nature. It is a new blend of oilfield, civil and mineral drilling technologies.

Most drillers will use methods that are either (a) vertical or horizontal underground or (b) surface penetration. Mitchell Drilling brought in a little of both. In Australia, where coal seams are found at shallower depths, greater pressures have to be created to bring out the gas from the horizontal seams. Khan said, "The combination of vertical and horizontal drilling allows for a much more efficient extraction of water from CBM wells while it increases the flow rates of gas from the wells." A number of coal, gas and oil companies have turned to Mitchell Drilling, including BHP, Anglo Coal and the Oil Company of Australia. MDC has drilled more surface to in-seam wells than any other Australian company.

It was a marriage of equals for PACE and MDC. PACE needed a drilling company, but PACE had built up strong network of relationships in China. While MDC would be used to potentially drill a large number of wells on the company's Guizhou project, both saw a new revenue source. "We are both leveraging on our connections, network and the ability to tap into these advanced projects in a shorter time frame." Khan believes revenues could be flowing into the PACE-MDC joint venture by the end of 2006. Khan said, "Other companies have expressed an interest in using the Dymaxion technology." When would such revenues become substantial? "Initially,

they would be somewhat minor, but they should ramp up quickly from two sides," explained Khan. "Revenues would come from outside companies who are seeking resources, and from PACE's own drilling activities within China."

How soon does Khan believe PACE will need the services of the MDC-PACE joint venture? "We have plans to move the Guizhou project into pilot production in 2007," he responded. "We may step up that program based on the results from our slim-hole test production program this year."

PACE announced earlier this month it should soon start drilling. Is Dr. Marchioni satisfied about the coal seam thickness on the first property the company plans to drill? "Very much so," he responded instantly. "At the depths we're considering right now, geological structure is relatively uncomplicated. The advantage we have here is the maturity of these coals means that the gas contents are quite high by most standards, at relatively shallow depths. Presently, our plan is to try to exploit at relatively shallow depths, down to 800 or 900 meters maximum. This will give us a lot of gas. It will optimize our chances of finding permeability."

The Basics on Coal Bed Methane Projects

With coal bed methane, the gas content per unit volume of coal increases with depth. Pressure is what holds it in the coal. Often, companies drill deeper looking for more gas per unit volume of coal. However, according to Marchioni, "The deeper you go, permeability decreases. And it decreases exponentially, not linearly." There's always a trade-off in any coal basin. Geologists will try to find the depth where they will find optimal gas content and optimal permeability. Of course, the more shallow the depth, where you can find an economic gas deposit, the better for the company and its shareholders.

What do you need to know about CBM risks? The risk is permeability and the ability to produce the gas from the coal. Permeability, as Marchioni explained, is the ability for the gas to flow from the coal into the well bore. "Coal typically has a set of fractures, a natural set of fractures, in it," he clarified. "They can be better or less well developed. It can have minerals in them, for instance. A

mineral can be deposited there that can plug between the fractures. Coal, as a substance, has very low permeability. But because it is fractured, it can have good permeability.”

We asked Dr. Marchioni point blank about the project PACE will soon be drilling, “We don’t feel there’s much risk on the coal being there. We have abundant evidence for that. I don’t feel there’s very much risk about gas content. There’s a lot of Chinese testing, and even if it is not fully accurate, within the margins of error, you’d still have a lot of gas in the ground. Much of the place has already been explored for coal.”

He cautioned, “The risks in any CBM play are: ‘Can you get out of the ground at the right price?’ What influences that is the permeability of the coal and also the amount of water that is there. We’re looking for permeability. That’s what we are trying to measure: If there’s water there, can we pump out the water fast enough to reduce the head of water so that we drop the pressure on the coal? That’s basically what we have to do. You have to drop the pressure and allow the gas to bleed off.”

And that is what makes this exploration. “Everything we’ve got in terms of water, permeability, and that kind of stuff is coming from coal mines that are very shallow.” The slim-hole drilling, over the next several months, should answer many of Dr. Marchioni’s questions.

**WEBSITES and Trading Symbols of companies
featured in this Special Report:**

[Pacific Asia China Energy \(TSX: PCE; Other OTC: PCEEF\)](#)

[Verona Development Corporation \(TSX: VDC\)](#)

[Ivana Ventures Inc \(TSX: ANA\)](#)

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