

7 CHINA



7.1 Summary of Coal Industry

7.1.1 ROLE OF COAL IN CHINA

Coal accounts for 69.91 percent of total national energy consumption in China (EIA, 2007a). Ranking first in the world in production of coal, China exported 82.6 million tonnes (Mmt) of coal in 2005 (EIA, 2007b); however, exports have been on the decline in more recent years (EIA, 2010). Table 7-1 provides recoverable reserve and recent coal production data for China.

Table 7-1. China's Coal Reserves and Production

Indicator	Anthracite & Bituminous (million tonnes)	Sub-bituminous & Lignite (million tonnes)	Total (million tonnes)	Global Rank (# and %)
Estimated Proved Coal Reserves (2005)*	62,200.4	52,300.3	114,500.7	3 (13.7%)
Annual Coal Production (2008)**	2,482.5	101.1	2,583.6	1 (39.17%)

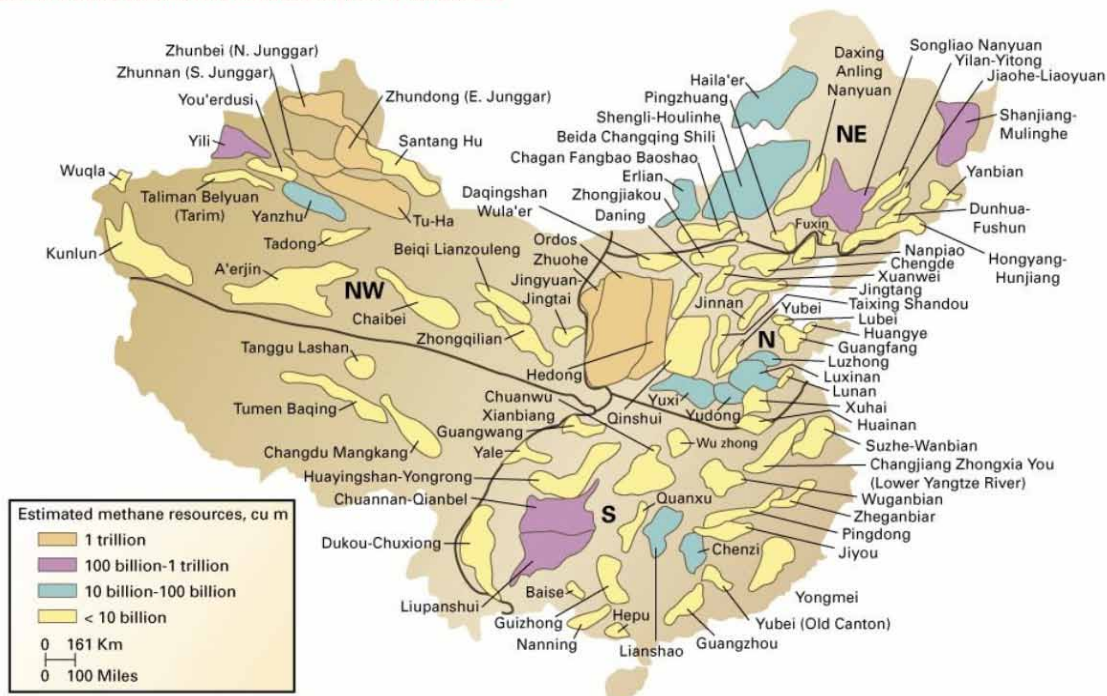
Source: *EIA (2007c); **EIA (2009a) Note: Numbers may not add due to rounding

As shown in Figure 7-1, the following major coal basins are located in four regions of China (USEPA, 1996):

- Sanjuang-Mulinghe, Songliao, Donhua-Fushun, and Hongyang-Hunjiang basins in the Northeast;
- Taixing-Shandou, Qinshui, Daning, Ordos, Hedong, Yuxi, Xuhuai, and Huainan basins in the North;
- Chuannon-Qianbei, Huayingshan-Yongrong, and Liapanshui basins in the South; and
- Tarim, Qaidam, and Junggar basins in the Northwest.

Figure 7-1. China's Coal Fields

CHINA'S COAL BASINS AND COALBED METHANE RESOURCES



Source: Liu (2007)

7.1.2 STAKEHOLDERS

Table 7-2 identifies some of the key stakeholders for coal mine methane (CMM) project development in China.

Table 7-2. Key Stakeholders in China's CMM Industry

Stakeholder Category	Stakeholder	Role
Mining companies	Large coal groups, such as: <ul style="list-style-type: none"> ▪ Fushun Mining Group ▪ Hebi Coal Industry Group ▪ Huaibei Mining Group ▪ Huainan Mining Group ▪ Jincheng Anthracite Coal Group ▪ Panjiang Coal & Power Group ▪ Shuicheng Mining Group ▪ Songzao Coal & Power Group ▪ Tiefsa Mining Group ▪ Yangquan Coal Group 	Project hosts
Equipment manufacturers	<ul style="list-style-type: none"> ▪ Shengli Power Machinery 	Methane treatment and utilization equipment

Stakeholder Category	Stakeholder	Role
Developers	<ul style="list-style-type: none"> ▪ China National Petroleum Corporation ▪ China United Coalbed Methane Corporation Ltd. ▪ CBM Exploitation and Development Company of the PetroChina Company Ltd. ▪ Lanyan CBM Company of the Jincheng Anthracite Coal Mining Group ▪ See also www.epa.gov/coalbed/networkcontacts.html 	Project opportunity identification and planning
Engineering, consultancy, and related services	<ul style="list-style-type: none"> ▪ China Coalbed Methane Clearinghouse, affiliated with the China Coal Information Institute ▪ Guizhou International Cooperation Center for Environmental Protection ▪ See also www.epa.gov/coalbed/networkcontacts.html 	Technical assistance
Universities, Research Establishments	<ul style="list-style-type: none"> ▪ China Coal Research Institute ▪ China University of Mining and Technology ▪ China University of Petroleum, Beijing ▪ China National Administration of Coal Geology ▪ China Coal Information Institute 	Technical assistance
Regulatory Agencies and Government Groups	<ul style="list-style-type: none"> ▪ National Development and Reform Commission ▪ National Institute for Occupational Safety ▪ State Administration of Coal Mine Safety, within State Administration of Work Safety ▪ China National Coal Association ▪ International Exchange Center of National Work Safety Administration 	Project identification and assessment support

Source: M2M-China (2006); Huang (2007)

7.1.3 STATUS OF COAL AND THE COAL MINING INDUSTRY

China is the world's leading producer of coal, producing more than 2.5 billion tonnes of coal in 2008 (Table 7-1). Coal is produced throughout China in 27 provinces. Northern China, especially Shanxi Province, contains most of China's easily accessible coal and virtually all of the large state-owned mines (EIA, 2009b).

China has a large number of coal mines but has been attempting consolidation. It is estimated that in the mid-1990s, there were nearly 100,000 coal mines in China (IEA, 2009). The majority of these mines belonged to villages and towns. In the last decade, China has implemented a program to close down underperforming or unsafe mines, especially town and village coal mines. For example, an initiative in Henan Province aims to close all mines with annual capacity below 150,000 tonnes (GLG, 2010). Shanxi Province is also closing a number of small mines, and Guizhou Province is closing 78 mines in 2010 (Steel News, 2010).

As of the end of 2009, there are 12,122 coal mines operating in China. Of these, 2,059 mines are owned by large, state-owned coal mine groups (known as "key coal mine groups"), accounting for 61.7 percent of total coal production. An additional 10,067 mines are operated by villages and towns (Guoquan, 2010). See Table 7-3 below.

Table 7-3. China's Mines by Category and Percent of Total Production (2004)

Mine Category	Number of Mines	% of Total Production
Local State-owned Key Coal Mine Groups	1,190	12
Other State-owned Key Coal Mine Groups	869	49.7
Mines Belonging to Villages and Towns	10,067	38.2

Source: Guoquan (2010)

Most coal mines in China are underground mines. In 1996, underground mining accounted for 95 percent of Chinese coal production (USEPA, 1996); more recently, underground mines produced about 90 percent of Chinese coal (Tu, 2007).

7.2 Overview of CMM Emissions and Development Potential

Large, state-owned coal mines dominate Chinese coal production and CMM emissions. About 46 percent of large, state-owned mines are considered gassy (Huang, 2008). Large, state-owned mines accounted for more than 86 percent of CMM emissions (2000), and produced 42 percent of total national coal production in 2004 (Zhang et al., 2004).

7.2.1 CMM EMISSIONS FROM OPERATING MINES

Increasing numbers of Chinese mines are installing drainage (degasification) systems. By 2006, more than 300 mines had installed CMM drainage systems, which collectively removed more than 3.24 billion cubic meters (m³) of CMM. Approximately 80 percent of all CMM drained was from key, state-owned coal mines (Huang, 2007). In 2009, China's CMM drainage volume nearly doubled, and reached 6.17 billion m³. The volume of CMM recovered and used in 2009 exceeded 1.77 billion m³, almost triple 2005 levels (Huang, 2010).

Table 7-4 shows historical data (where available) for CMM emissions, drainage, and utilization levels in China.

Table 7-4. China's CMM Emissions (million cubic meters)

Year	CMM Emissions	CMM Drainage	CMM Utilized
1987	6450		
1990	8830*		
1992	8320		
1993	8550		
1994	8950		
1995	8,900; 10,441*		
1996	9,280		
1997		760	
1998		740	361.78
1999		790	362
2000	9,630; 8,235*	870	318.4
2001		980	458.28

Year	CMM Emissions	CMM Drainage	CMM Utilized
2002	9,871	1,150	455.67
2003	11,674	1,521	629.21
2004	13,535	1,929	603
2005	9,500*		
2008			
2009		6,170**	1,770**
2010 (projected)	10,767*		

Source: M2M-China (2006); *USEPA (2006a); **Huang (2010)

In China, the main types of CMM use projects are town gas, electricity generation, industrial boiler fuel feed, vehicle fuel, and thermal applications (e.g., office space heating). Some Chinese CMM projects involve multiple end uses. As of 2009, China's CMM use projects utilized 1.72 billion m³ of methane. CMM-to-power projects generated a total of more than 900 megawatts (MW) of power by the end of 2008. Additionally, approximately 4,000 vehicles operate on CMM as fuel (Huang, 2010).

As technology has advanced, the utilization efficiencies of CMM projects have also improved, increasing the size of individual projects (Huang, 2007).

The largest CMM power project in the world is at the Sihe Mine in Jincheng, Shanxi Province. This project uses Caterpillar engines to generate electricity at a 120-MW capacity power plant. The project utilizes 180 million m³ of both coalbed methane (CBM) and CMM from the Sihe mine (USEPA, 2006b; Huang, 2008). The Sihe project avoids the release of 2.5 million tonnes of carbon dioxide equivalent (MmtCO₂e) annually (M2M, 2010).

Internal and external investments in Chinese projects are increasing, with involvement of companies such as China Shandong Shengdong, Jenbacher, and Deutz (Huang, 2007). Furthermore, use of CMM resources is being expanded for application in the chemical industry in China. For example, formaldehyde and carbon black are being produced using CMM in Fushun, Huainan, Zhongliangshan, Songzao, and Tianfu.

Information on individual CBM/CMM use projects in China can be found in the Global Methane Initiative (formerly Methane to Markets Partnership) International CMM Projects Database, which includes information on more than 200 current and planned CMM projects around the world (M2M Projects, 2010). The database includes 55 active or proposed CMM projects in China, all at active underground mines. Of these projects, four use CMM as boiler fuel; three provide methane for industrial use; 24 use CMM for power generation; 12 provide town gas; three provide vehicle fuel; and five are ventilation air methane (VAM) mitigation projects (M2M Projects, 2010).

China is host to the first VAM project approved by the United Nations Framework Convention on Climate Change (UNFCCC). The VAM abatement and energy recovery project was commissioned in October of 2008 in Zhengzhou and provides hot water for local use (Mattus, 2010). Annual emission reductions average 382 thousand tonnes of carbon dioxide equivalent (MtCO₂e) (UNFCCC, 2008). Additionally, at the Datong mine in Chongqing Municipality, a project is being developed that will be the largest VAM abatement system in the world. This system is expected to reduce greenhouse gas (GHG) emissions by up to 200,000 tons of CO₂e per year (CMOP, 2010). An additional four VAM projects are in development throughout China (M2M Projects, 2010).

The world's largest CMM to liquefied natural gas (LNG) plant was recently announced. Chongqing Energy Investment Group Corporation, Chongqing Songzao Coal and Electricity Co., Ltd. and Hong Kong and China Gas, a wholly owned subsidiary of ECO Environmental Investments Limited, signed a joint venture in Hong Kong for construction and operation of a CMM liquefaction project at the Songzao coal mines. This project is a result of a feasibility study funded by the U.S. Environmental Protection Agency. The project will be built in Songzao, Qijiang and will utilize 110 million m³ of CMM annually. Construction of this project is expected to be completed in 2011 (CQEIG, 2009).

7.2.2 CMM EMISSIONS FROM ABANDONED COAL MINES

The China Coal Information Institute (CCII) established the Abandoned Mine Methane Project Advice Centre (AMMPAC) to advise and promote the country's abandoned mine methane (AMM) use (Sage, 2003). Information about this program is available at <http://www.coalinfo.net.cn/cnuk/eprojects/05.htm>.

The closing of state-owned coal mines and town and village coal mines that do not meet production and safety requirements has left a large number of abandoned mines throughout China. Hundreds of coal mines have been abandoned since the 1950s and abandoned reserves are estimated at more than 30 billion tonnes. To date, no AMM projects have been initiated in China.

The China Coal Research Institute has also studied AMM resources in China, focusing on detailed geological conditions, characteristics of AMM reservoirs, gob/goaf area and coal reserve estimation, ground water study and mine gas sampling, and AMM resource estimation.

7.2.3 CBM FROM VIRGIN COAL SEAMS

China's CBM resources contained in bituminous and anthracite coal deposits at depths between 300 and 2000 meters are estimated to be 36.8 trillion m³ (Huang, 2010). Of these CBM resources, more than 68 percent are found in eastern China (CCII, 2005).

The total production of CBM has increased dramatically within the last decade. Total Chinese CBM production was estimated to be 1.4 billion m³ in 2006, and almost 5 billion m³ in 2008. The national production target for CBM is 10 billion m³ by 2010 (Huang, 2007; EIA, 2009b; Merrill, 2007).

By the end of 2008, a total of 3,400 CBM wells had been drilled in China. Of these, 1,453 CBM wells were drilled by the Jincheng Anthracite Mining Group with a total production capacity of 600 million m³. In 2009, CBM produced by this Mining Group alone reached 376 million m³ (Huang, 2010).

Between 2011 and 2015, China National Petroleum Corp. (CNPC), China's largest oil and gas producer, plans to invest \$1.14 billion between in drilling 371 horizontal wells in the Zhengzhuang, Qinnan, Mabi, and Xiadian blocks of the Qinshui Basin in Shanxi Province to increase annual production capacity by 1.9 billion m³. CNPC estimates that its CBM output in Qinshui Basin will reach 2 billion m³ in 2015 (China Coal Resource, 2010).

7.3 Opportunities and Challenges to Greater CMM Recovery and Use

China is a signatory to both the UNFCCC and the Kyoto Protocol (Table 7-5). As a Non-Annex I Party to the Kyoto Protocol, China is eligible to host GHG mitigation projects, such as CMM projects, under the Clean Development Mechanism (CDM). The CDM can create additional revenues for CMM projects in China through carbon credits trading. As of July 2010, China had 883 registered CDM projects. Of these,

27 are CMM projects. An additional 52 CMM projects are at various stages in the CDM pipeline, including 34 at validation (UNEP, 2010).

Table 7-5. China's Climate Change Mitigation Commitment

Agreement	Signature	Ratification
UNFCCC	June 11, 1992	January 5, 1993
Kyoto Protocol	May 29, 1998	August 30, 2002

Source: UNFCCC (2010)

Though China has no emissions targets under the UNFCCC or Kyoto Protocol, China's government announced in November of 2009 that it would cut emissions of carbon relative to economic growth by 40 percent to 45 percent by 2020 compared with 2005 levels (Huang and Wu, 2010).

7.3.1 MARKET AND INFRASTRUCTURE FACTORS

China is implementing several efforts to promote CMM projects. The State Council, China's highest organ of State administration, allocated a fund of 3 billion Yuan in 2005 to support gas control projects in key state-owned mines, and established a CBM/CMM Engineering Research Center. The State Council has also mandated methane emission monitoring at 45 large, state-owned, gassy coal mines (Huang, 2005b). Furthermore, the Chinese government included the development of CBM in China's 11th Five-Year Energy Development Plan (2005–2010) (CCII, 2005). End-use options for CMM projects include power generation, feedstock for chemicals industry (e.g., methanol, formaldehyde, carbon black, fertilizer), natural gas-fueled vehicles, and VAM used as part of mixed fuel for coal-fired boilers and gas turbines (Zhang et al., 2004).

Many organizations in China and abroad have financially sponsored the research and development of CMM projects (M2M-China, 2006). They include the China Coalbed Methane Clearinghouse of CCII, National Development and Reform Commission, State Administration of Coal Mine Safety (SACMS), U.S. Trade and Development Agency, World Bank, Asian Development Bank (ADB), Global Environment Fund, Clean Development Mechanism, and Japan Development Fund.

Relatively few of China's underground coal mines have installed degasification systems. Even where degasification systems have been installed, they have encountered challenging geologic conditions for which existing degasification technologies are often insufficient (Huang, 2005c).

Even where there are drainage systems in place, a number of challenges still impede effective recovery and use of methane from mine drainage systems. These barriers include small project sizes, unstable methane supplies, and the high capital cost of power generation projects.

Furthermore, China lacks an extensive natural gas pipeline infrastructure for gas delivery, so there is very limited access for CMM that is recovered and upgraded. Most of the mines in China are located in remote mountain areas, where the geology makes it difficult to construct long-distance pipelines to deliver the drained CMM to cities. The West-East (W2E) Natural Gas Pipeline began operating in October 2004, and has a capacity of 17 billion m³ of natural gas, which is supplied to 10 provinces across China's Eastern and Western regions. However, only a few coal mining areas are close enough to the pipeline to have the possibility of accessing it for delivery of CMM.

A pipeline from Duanshi County to Qinshui County in Shanxi Province and to Boai County in Henan Province has been in construction since September 2009, and is estimated to be finished in 2010. The total investment for the project is approximately 458 million RMB (US\$67.6 million) (Guoquan, 2010).

Further, PetroChina expanded the pipeline network by connecting four main pipelines – the W2E pipeline, the Shaanjing pipeline, the Zhongwu pipeline, and the Seninglan pipeline. PetroChina is also developing a CBM pipeline from Taiyuan to Yangquan to Shijiazhuang with a total length of 250 km and investment of 400 million RMB (US\$59 million) (Guoquan, 2010).

The ADB also funded a local pipeline in the southern Qinshui basin to transport low-quality gas from mines to more central locations to increase the gas quality (e.g., methane concentration) by supplementing with higher-quality gas from other mines to meet PetroChina's pipeline quality specifications.

There is increasing interest in China in converting CMM to LNG. Low-temperature liquefaction reduces the volume of CMM by a factor of 625; a standard liquefied gas tanker can hold 21,000 m³ of CMM. Cryogenic technologies used commercially in the United States provide liquefaction rates of 1,000 to 10,000 gallons per day. The Yangquan Coal Industry Group and the Cryogenics System Key Technology Group of the Technical Institute of Physics and Chemistry of the Chinese Academy of Sciences have been exploring the separation and liquefaction of CMM, and by July 2007, had shown success in concentrating the liquid to 99 percent (Huang, 2007). These efforts resulted in the D-O2TE process developed by the Dalian Institute of Chemical Physics with the Chinese Academy of Sciences. The process is described as oxygen-methane catalytic deoxidation technology and will be utilized at the upcoming CMM liquefaction project at the Songzao coal mines (Bloomberg, 2009; DNL, 2009).

7.3.2 REGULATORY INFORMATION

In China, recovery and utilization of CMM can only be exercised by coal enterprises with legal mining licenses. CMM projects require approval from the National Development and Reform Commission (NDRC) at the county, provincial, and central government level, depending on the size and type of project. CMM power generation projects that are connected to the power grid must be approved by the investment administration of the provincial government. CMM projects generating power used only by the mining company must be recorded by the investment administration of the local government. The investment administration of provincial government shall report both approved and recorded projects to the investment administration of the State Council (NDRC, 2007).

A CBM or CMM pipeline project with the capacity to transport more than 500 million m³ a year or crossing provincial borders shall be approved by the investment administration of the State Council. A CBM or CMM pipeline project with capacity to transport less than 500 million m³ a year shall be approved by the investment administration of the provincial government (GOSC, 2006).

China has established a number of financial incentives to encourage CMM projects.

- For example, no royalties are assessed on CMM consumed by projects developed by coal mine enterprises with approved mining licenses.
- Coal enterprises conducting CMM recovery and utilization projects with approved mining licenses receive preferential state policies on the resources tax, value-added tax (VAT), income tax of enterprises, and the tariff tax, as well as other benefits.
- China's Central Government provides 3 billion RMB for coal mine safety projects each year, most of which is used for mine gas recovery projects. Coal mines can collect 15–20 RMB per ton from coal sales to be applied to mine safety projects (Huang and Wu, 2010).
- On October 25, 2006, the Ministry of Finance, the State Administration of Taxation, and China Customs exempted import tariffs and VATs for CMM equipment, instruments, spare parts, and tools. Since January 1, 2007 the same bodies have implemented a “levy-first-refund-later” policy on CMM drainage and sales (Huang, 2007).

- Additionally, CMM projects may be eligible to deduct 50 percent of the cost of research on new technologies or processes before income tax (Huang and Wu, 2010).

The rights to exploration and development of CMM or CBM projects in China have been modified to be more inclusive. Initially, the China United Coalbed Methane Corporation (CUCBM) had the monopoly rights to CMM or CBM exploration, development, and production in cooperation with foreign firms. If a commercial CBM field was found, CUCBM and the foreign party would jointly establish an organization and conduct development and production. However, on September 24, 2007, the State Council modified the relevant regulations, “Regulations of the People’s Republic of China on Exploitation of On-shore Petroleum Resources in Cooperation with Foreign Countries,” to effectively eliminate the CUCBM monopoly. The law now includes the option for “other companies designated by the State Council” to join with foreign businesses in exploiting CMM resources (Huang, 2007). Alternatively, if a CMM development project is to be realized by foreign grants or free technical assistance (i.e., if the projects are non-profit and non-commercial in nature), it is not necessary to involve CUCBM (CBMC, 2004).

All CMM projects must conform to relevant environmental and safety regulations before operating. Projects should focus on waste water drainage, atmospheric pollution, and noise pollution. Energy use during the projects should be in accordance with the “Energy Conservation Law of the People’s Republic of China” and the energy-saving regulations and measures of the state and local governments. The State Administration of Work Safety (SAWS) monitors worker safety in China. Laws and regulations such as the “Coal Mine Safety Regulation” should be followed when developing CMM exploitation and utilization projects.

The price structure in China favors use of CMM over natural gas, with the consumer price of CMM for civil and industrial consumption set far lower than that of natural gas (M2M-China, 2006). In 2004, the average price of natural gas for residential and commercial users in China was 1.6 Yuan/m³ and the average price for industrial users was 1.9 Yuan/m³. The wellhead gas price is about 1.3 Yuan/m³ for 100 percent methane. As a further boost, in April 2007, the Ministry of Finance provided a subsidy of 0.2 Yuan/m³ for CMM exploitation enterprises; the local finance departments are allowed discretion to increase their own subsidies based on this standard (Huang 2007; Guizhou, 2008).

Effective January 1, 2005, SAWS and SACMS released a Coal Mine Safety Regulation relevant to the CDM. Section 148 requires that in order for CMM projects to be registered as CDM projects, gas concentrations must be at least 30 percent methane. Many coal mines in China recover only low concentration gas (i.e., less than 30 percent methane concentration), the regulation and would therefore be unable to qualify for CDM projects (Guizhou, 2007).

7.4 Profiles of Individual Mines

Feasibility studies for CMM projects at a few Chinese mines, profiles of some individual mines in China, and descriptions of CMM project opportunities are available on the following websites:

Global Methane Initiative (formerly Methane to Markets Partnership):

<http://www.methanetomarkets.org/projects/index.aspx>

US EPA: <http://www.epa.gov/cmop/resources/international.html>

China Coal Information Institute: <http://www.nios.com.cn/cbmproject.html>

7.5 References

- Bloomberg (2009): Chongqing Energy Investment Group and the ECO Environmental Investment to Build 91 Million Cubic Meters CBM Liquefaction Project in Chongqing, Bloomberg Business Week, December 3, 2009. <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=28718920>
- CCII (2005): CBM Resources in China. Transmitted via e-mail by China Coal Information Institute, May 2006.
- China Coal Resource (2010): CNPC coalbed methane project in Shanxi sets production goals for 2020, China Coal Resource, April 28, 2010. <http://en.sxcoal.com/NewsDetail.aspx?cateID=174&id=30504>
- CMBC (2004): Investment Guide for China CMM/CBM. China Coalbed Methane Clearinghouse, Beijing, China. <http://www.epa.gov/cmop/docs/guidline3.doc>
- CMOP (2010): CBM Note - MEGTEC Systems to build world's largest coal mine ventilation methane emissions abatement system in China, June 10, 2010.
- CQEIG (2009): Chongqing Energy cooperation with the Hong Kong and China Gas Company building the world's largest gas liquefaction project, Chongqing Energy Investment Group, December 4, 2009. <http://www.cqenergy.com/nyxw/6010.htm>
- DNL (2009): Oxygen-methane catalytic oxygen technology (D-O2TE) identified by the results (Chinese), Dalian National Laboratory for Clean Energy, November 20, 2009. <http://www.dnl.ac.cn/manage/kydt/20091120.asp>
- EIA (2007a): Data obtained from *International Energy Annual 2005*. U.S. Energy Information Administration, Washington, DC, tables posted September 21 and 17, 2007, respectively. <http://www.eia.doe.gov/pub/international/iealf/tablee1.xls> (total consumption)
<http://www.eia.doe.gov/pub/international/iealf/tablee4.xls> (coal consumption)
- EIA (2007b): Data obtained from *International Energy Annual 2005*. U.S. Energy Information Administration, Washington, DC, table posted September 17, 2007. <http://www.eia.doe.gov/emeu/international/RecentCoalSupplyDispositionBtu.xls>
- EIA (2007c): Data obtained from *International Energy Annual 2005*. U.S. Energy Information Administration, Washington, DC, table posted June 21, 2007. <http://www.eia.doe.gov/pub/international/iea2005/table82.xls> (reserves)
- EIA (2009a): International Energy Statistics. U.S. Energy Information Administration, Independent Statistics and Analysis, 2009. <http://tonto.eia.doe.gov/cfapps/ipdbproject/IEDIndex3.cfm>
- EIA (2009b): EIA Country Analysis Brief: China - Coal. U.S. Energy Information Administration, Washington, DC. July 2009. <http://www.eia.doe.gov/emeu/cabs/China/Coal.html>
- EIA (2010): China Country Energy Profile, U.S. Energy Information Administration, Washington, DC, updated May 18, 2010. http://tonto.eia.doe.gov/country/country_energy_data.cfm?fips=CH
- GLG (2010): China launching the second wave of coal industry consolidation in Henan, Gerson Lehrman Group, May 25, 2010. <http://www.glgroup.com/News/China-launching-the-second-wave-of-coal-industry-consolidation-in-Henen-48616.html>
- GOSC (2006): On Accelerating CBM (CMM) Drainage and Utilization, Guo Fa Ban [2006] No. 47, General Office of State Council, June 15, 2006.
- Guizhou (2007): The Insider, CMM Recovery and Utilization Initiative Guizhou Province, China, Autumn Issue, 2007. http://www.gzcmm.org/en/admin/web_edit/uploadfile/20071017174327765.pdf
- Guizhou (2008): The Insider, CMM Recovery and Utilization Initiative Guizhou Province, China, Winter Issue, January 2008. http://www.gzcmm.org/Newsletter/Winter_2007_English.pdf

- Guoquan (2010): Information provided via personal communication with Guoquan Zhao from China Coal Information Institute, July, 2010.
- Huang (2005a): CMM Drainage and Utilization to Improve Coal Mine Safety in China, Huang Shengchu, presented at the 2005 International Workshop on CMM/VAM Recovery and Utilization, Chengdu, Sichuan Province, China, April 6–7, 2005.
- Huang (2005b): Overview of Coal Mine Methane to Markets Partnership in China, Huang Shengchu, China Coal Information Institute & National Institute for Occupational Safety, presented at the Methane to Markets Regional Workshop, Beijing, China, December 2, 2005.
- Huang (2005c): Potential of Developing Coal Mine Methane CDM Projects, Huang Shengchu, President, China Coal Information Institute & National Institute for Occupational Safety, October 21–23, 2005.
<http://cdm.cchina.gov.cn/UpFile/File410.PDF>
- Huang (2007): Progress and Project Opportunities of the CMM Development and Utilization in China, Huang Shengchu, presented at the Methane to Markets Partnership Expo, Beijing, China, October 30 - November 1, 2007.
- Huang (2008): Development and Utilization of Coal Mine Methane in China, Huang Shengchu, presented at the 9th International Symposium on CBM/CMM and Carbon Trading in China, Beijing, China, December 4, 2008.
- Huang (2010): Great Potential for CBM/CMM Recovery and Utilization and Preferential Policies, Huang Shengchu, presented at the Methane to Markets Partnership Expo, New Delhi, India, March 3, 2010.
http://www.methanetomarkets.org/expo/docs/postexpo/coal_shengchu.pdf
- Huang and Wu (2010): Current Status and Policy from Works of Methane Emission Reduction in China, Huang Shengchu and Wu Jianmin, presented at the Methane to Markets Partnership Expo, New Delhi, India, March 3, 2010. http://www.methanetomarkets.org/expo/docs/postexpo/china_huang.pdf
- Huang et al. (2005): New Development of CMM Projects in China, Huang Shengchu, Liu Wenge, Zhao Guoquan, Sun Qinggang, Liu Xin, and Dou Xiaodong, China Coal Information Institute & National Institute for Occupational Safety, presented at the 5th International Symposium on CBM.CMM in China, Beijing, China, November 30 - December 2, 2005.
- IEA (2009): Coal Mine Methane in China: A Budding Asset with the Potential to Bloom, International Energy Agency, Paris, France, February, 2009. http://www.iea.org/papers/2009/china_cmm_report.pdf
- Liu (2007): Case Study on CMM/CBM projects in China, Liu Wenge, China Coal Information Institute, presented at CMM Development in the Asia-Pacific Region: Perspectives and Potential, Brisbane, Australia 4–5 October 2006.
- Merrill (2007): CBM - Another green solution (Industry Overview), David Yip and Joseph Jacobelli, Merrill Lynch, June 18, 2007. <http://www.ml.com/media/79662.pdf>
- M2M (2010): Success Stories - China's Sihe Mine: Proving the Power of Coal Mine Methane Projects, Methane to Markets website, accessed July 6, 2010. <http://www.methanetomarkets.org/successstories.aspx>
- M2M Projects (2010): Methane to Markets International Coal Mine Methane Projects Database, Methane to Markets, 2008. <http://www2.ergweb.com/cmm/index.aspx>
- M2M-China (2006): Methane to Markets, 2006, China Profile.
<http://www.methanetomarkets.org/events/2006/coal/docs/china.pdf>
- NDRC (2007): A Notice on Using CBM (CMM) for Power Generation issued by National Development and Reform Commission (NDRC), Fagai Nengyuan [2007] No.721, April 2, 2007.
- Ren (2004): Methane Extraction And Utilisation From Abandoned Coal Mines- China/UK Technology Transfer, T X Ren, and Wardell Armstrong, University of Nottingham, 2004. <http://www.berr.gov.uk/files/file20542.pdf>

- Sage (2003): Reducing The Environmental Impacts Of Abandoned Coal Mines In China, P.W. Sage, D.P. Creedy, and Wardell Armstrong, Future Energy Solutions, 2003.
<http://www.coalinfo.net.cn/coalbed/meeting/2203/papers/coal-mining/CM015.pdf>
- Steel News (2010); Guizhou to close down 78 small coal mines, Steel News, June 7, 2010.
<http://www.steelorbis.com/steel-news/latest-news/guizhou-to-close-down-78-small-coal-mines-535917.htm>
- Sun and Liu (2006): Information provided by Sun Qinggang and Liu Wenge, CCII, 2006
- Tu (2007): Coal Mining Safety: China's Achilles' Heel, Tu JianJun, China Security, Vol 3 No 2 pp. 36–53, 2007 World Security Institute. http://www.wsichina.org/cs6_3.pdf
- UNEP (2010): CDM Pipeline Spreadsheet, UNEP Risoe Centre, July 1, 2010. <http://cdmpipeline.org/>
- UNFCCC (2008): Zhengzhou Coal Industry (Group) Co., Ltd. Coalmine Methane Utilization Project PDD, Version 2.5, completed August 8, 2008.
<http://cdm.unfccc.int/UserManagement/FileStorage/ZG3RM2OP7D5LJVYKC8XB06WH1NIQ94>
- UNFCCC (2010): Ratification Status, accessed June 16, 2010.
<http://maindb.unfccc.int/public/country.pl?country=CN>
- USEPA (1996): Reducing Methane Emissions from Coal Mines in China: The Potential for Coalbed Methane Development, U.S. Environmental Protection Agency, Coalbed Methane Outreach Program, 1996.
<http://www.epa.gov/cmop/docs/int004.pdf>
- USEPA (2006a): *Global Anthropogenic Non-CO₂ Greenhouse Gas Emissions: 1990–2020*, U.S. Environmental Protection Agency, Office of Atmospheric Programs, Climate Change Division, June 2006.
<http://www.epa.gov/nonco2/econ-inv/downloads/GlobalAnthroEmissionsReport.pdf> (Appendix B-2)
- USEPA (2006b): Power Plant to be Largest Run on Coal Mine Methane, Coalbed Methane Notes, U.S. Environmental Protection Agency, Coalbed Methane Outreach Program, May, 18, 2006.
<http://yosemite.epa.gov/opa/admpress.nsf/4d84d5d9a719de8c85257018005467c2/8ec89e33e48a863f852571720063e8d7!OpenDocument>
- Zhang et al. (2004): Potential for Development of CMM Projects in China, Zhang Binchuan, Huang Shengchu, Hu Yuhong, Liu Wenge, and Liu Xin, 2004, China Coal Information Institute, 2004.
<http://cdm.ccchina.gov.cn/english/UpFile/File6.DOC>