

Coalbed Methane Exploration in China*

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Search and Discovery Article #80038 (2009)

Posted January 20, 2009

*Adapted from oral presentation at AAPG Annual Convention, San Antonio, TX, April 20-23, 2008

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Abstract

China is the largest coal producing country in the world as well as the largest coal consuming country in the world. The national coalbed methane resources are 37 trillion cubic meters, located no deeper than 2,000 meters underground: 40 percent of the resources are in East China gas reservoirs; 18 percent are in Central China; 26 percent are in West China; and 16 percent are in South China. Over 46 percent of China's coal mines are rich in gas and over 1.3 billion cubic meters of gas are being emitted each year without being effectively used.

China is estimated to have the world's third-largest coalbed methane resources, which will play an important role in the country's plan to become a low-carbon economy. Coal-bed gas is not only an effective alternative energy source for China, the mining and use of it could also be helpful to avoid coal mine accidents as well as reducing the emission of methane.

Since the 1990s, experimental coalbed methane exploration activities have been carried out by domestic industrial sectors such as coal, petroleum oil and geological and mineral industries. The Chinese government is attaching more attention to the development of coal-bed gas from 2006 to 2010. China plans to increase its annual coal-bed gas output to 10 billion cubic meters in 2010 and 40 billion cubic meters in 2020. China has launched a coalbed methane liquefaction project that boasts the country's largest daily production capacity.



Coalbed Methane Exploration in China

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10 April 2008, Beijing, China



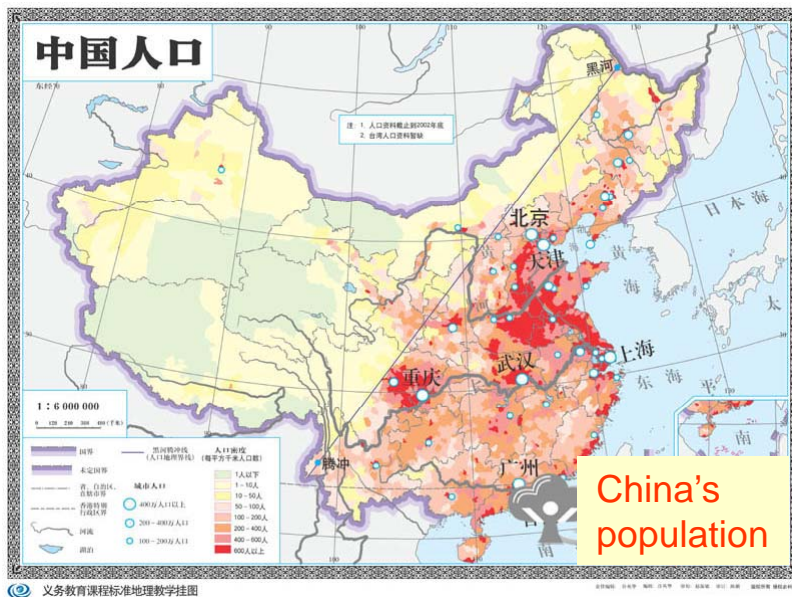
Presentation Outline

1. General Background

2. Development of Coalbed Methane in China

3. Challenges and Chances

4. Some Issues



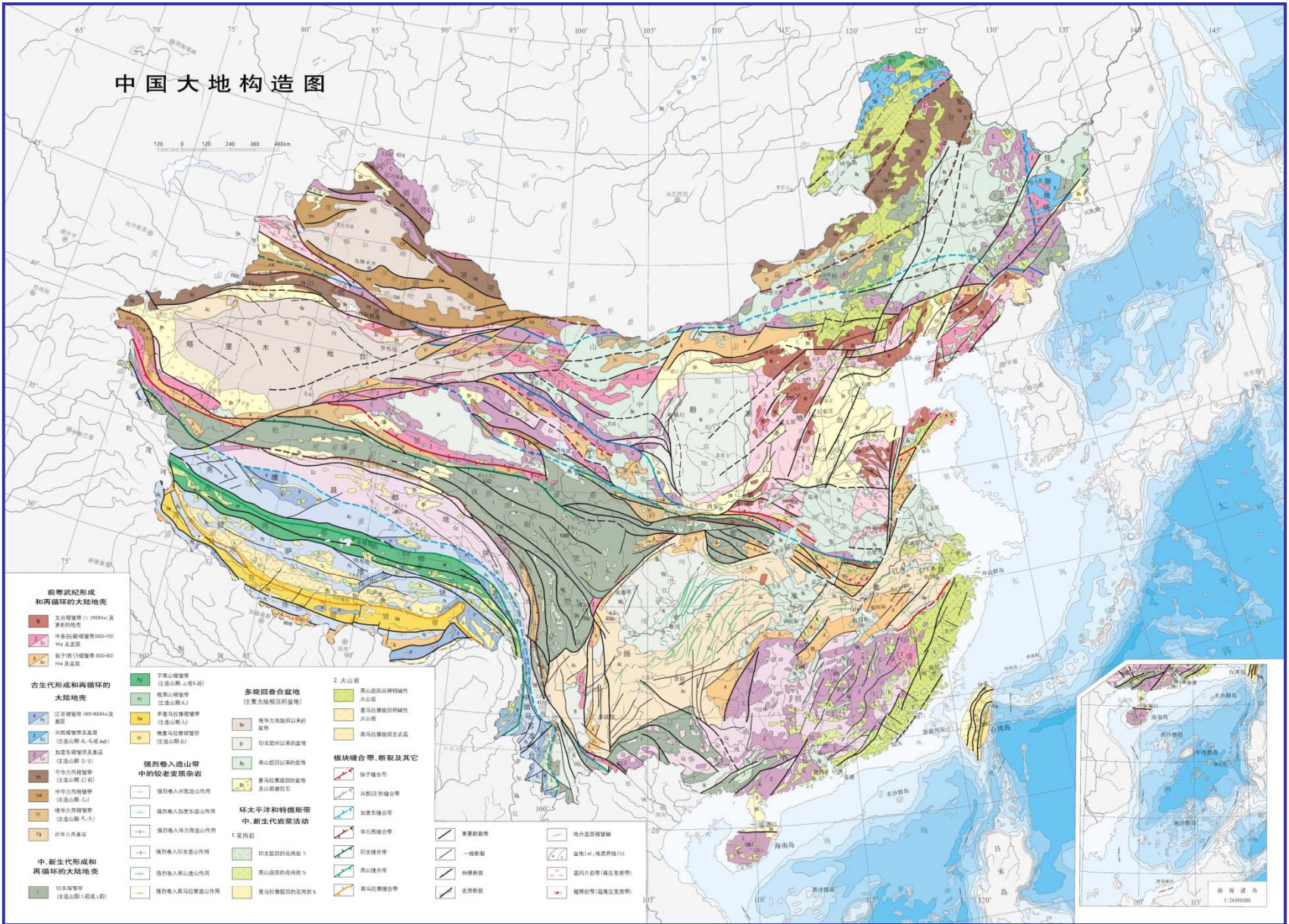
- **The world's most populous country**
- **The second largest energy consumer**
- **The highest production and consumption of coal**

West region

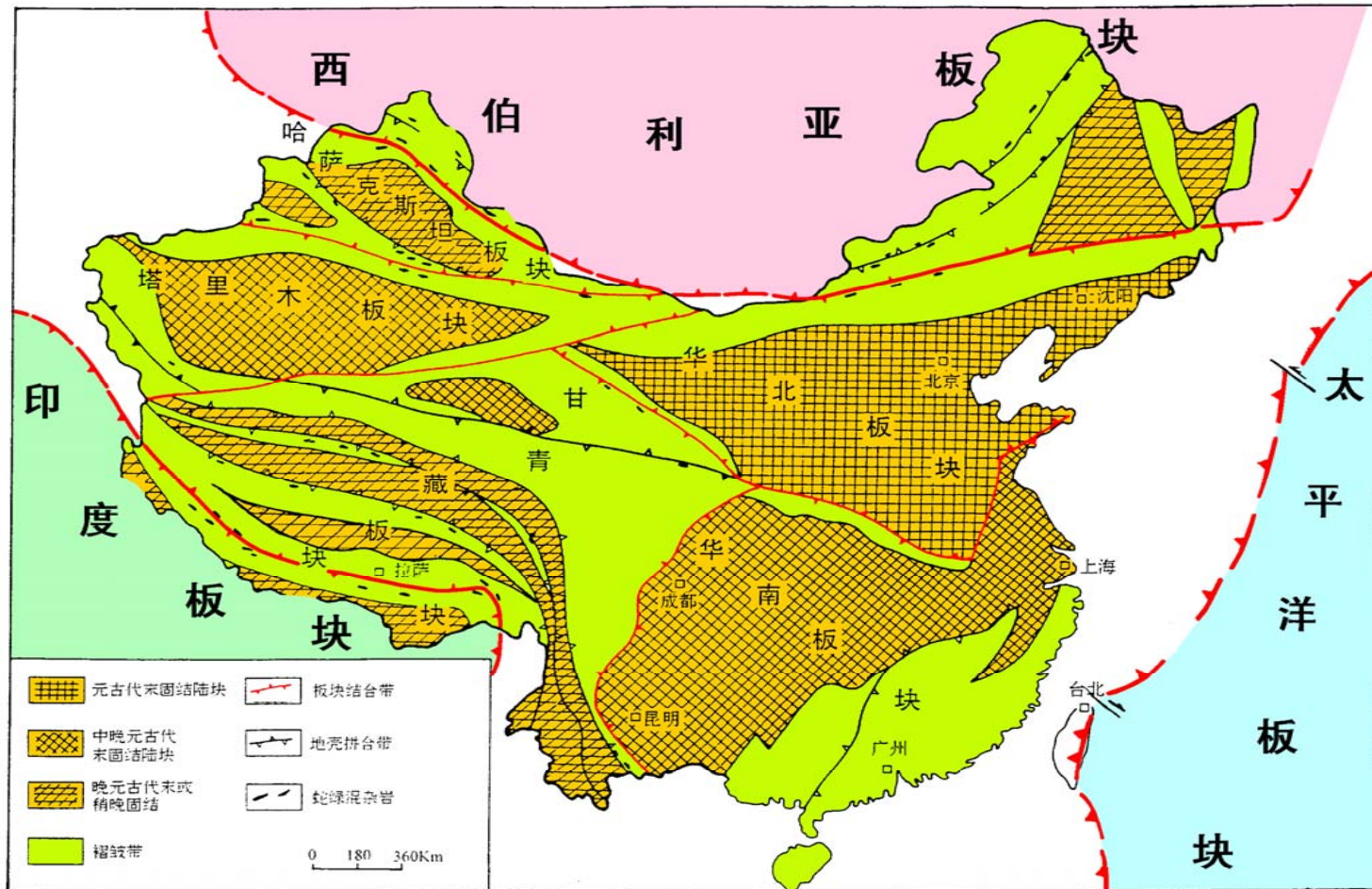


East region



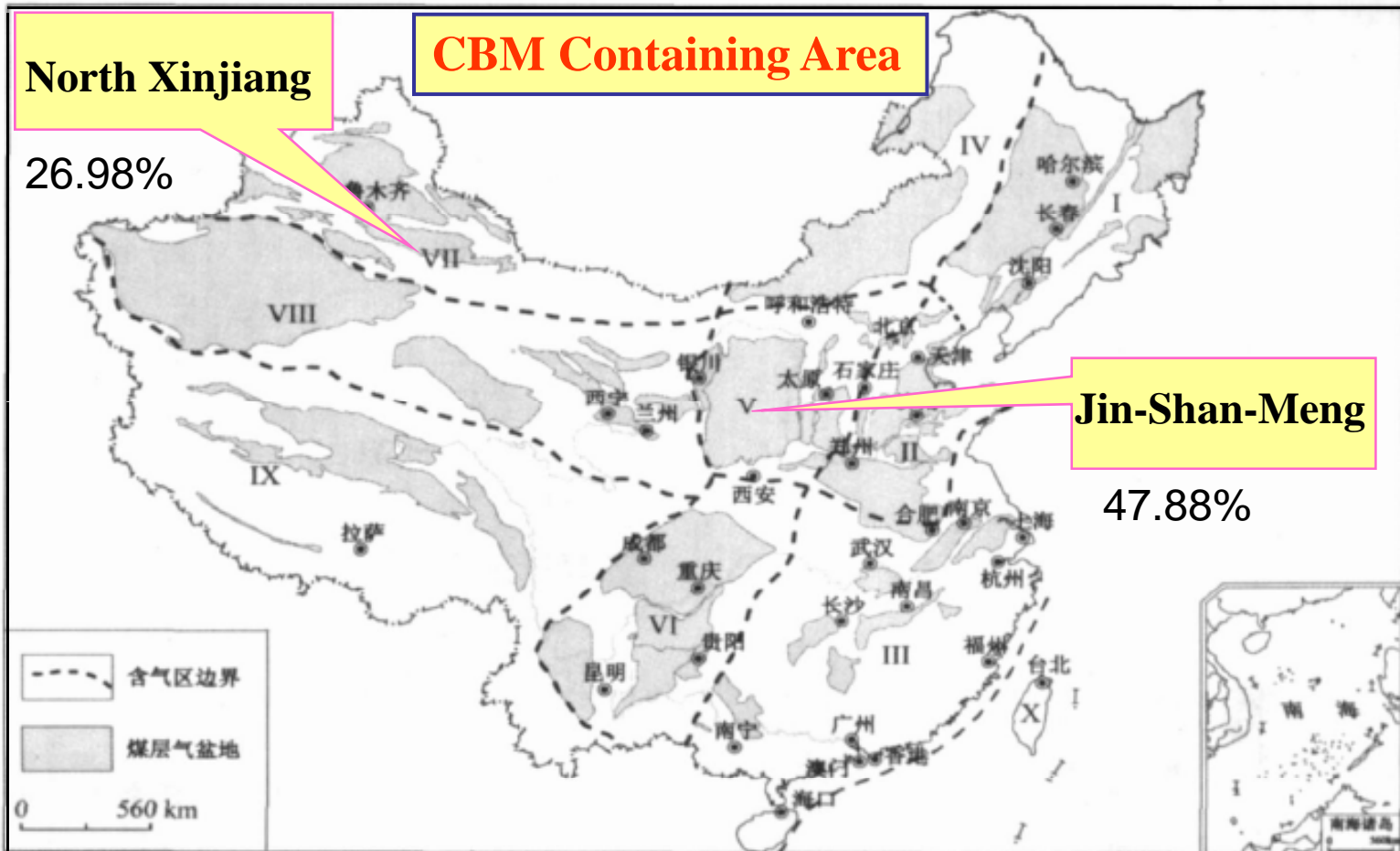


Geotectonic Map of China



Major Tectonic Units in China

- Sedimentary basins in China
- Very complicated evolution history



Distribution of coalbed methane basins in China (Zhang Xinmin et.al, 2007)

I Hei-Ji-Liao; II Ji-Lu-Yu-Wan; III South China; IV East Inner Mongolia; V Jin-Shan-Meng; VI Yun-Gui-Chuan-Yu; VII North Xinjiang; VIII South Xinjiang-Gan-Qing; IX Dian-Zang; X Taiwan



GENERAL BACKGROUND

- **Rich in coalbed methane**

- **China boasts 36.8 trillion cubic-meter resources of coalbed methane**

- **The third largest in the world, next only to Russia and Canada**

- **Sixty percent of the gas is stored in coal beds over 1,500 meters deep**

- **Easy to drill and develop**



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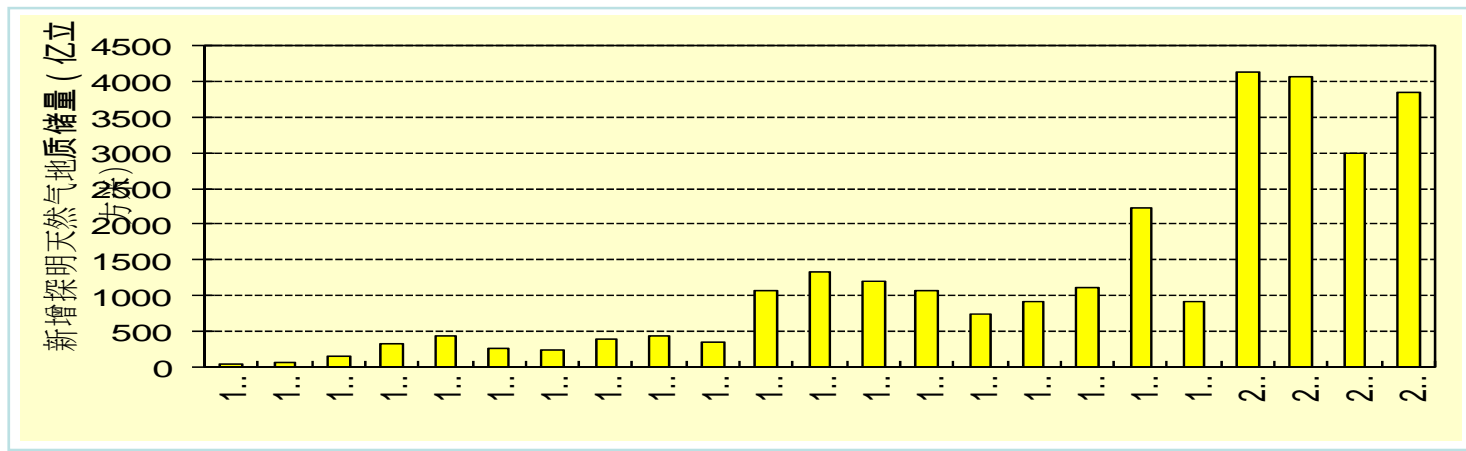
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DEVELOPMENT OF COALBED METHANE

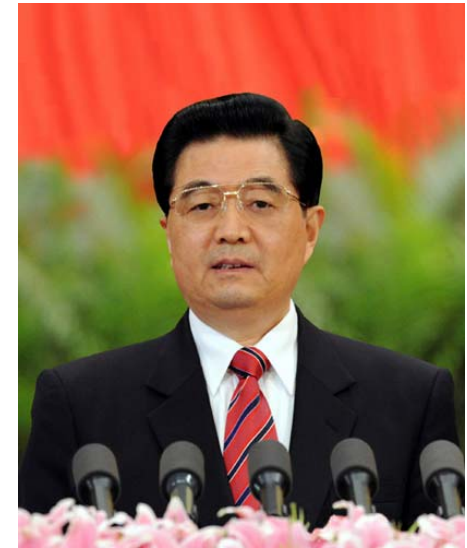
- Gas fuel is developing vigorously in China
- China is worrying about the supply-demand tension of natural gas.
- The abundant CBM becomes ideal alternative to natural gas
- CBM has already attracted attention of China's decision-maker



Gas Exploration in China (1981-2003)

Ensure a healthy and fast economic growth

- To develop in an economical, clean and safe way
- Reducing energy consumption per unit of gross domestic product by 20 percent by 2010
- Improve energy, resources, ecological and environmental conservation
- Enhance China's capacity for sustainable development
- The activities should benefit the whole society



President Hu Jintao

Suggestions for the 11th Five-year Plan (FYP)" proposed by President HuJingtao on October 11, 2005.



DEVELOPMENT OF COALBED METHANE

- **Since the 1990s, experimental CBM exploration activities have been carried out by domestic industrial sectors**
- **The CBM resources in place are 36.8 TCM [1]**
- **China plans to increase its annual coal-bed gas output to 10 billion cubic meters in 2010 and 40 billion cubic meters in 2020**
- **China is still in the early stages of CBM development**

[1] According to the new round of China's petroleum resources assessment

DEVELOPMENT OF COALBED METHANE



中联煤层气有限责任公司
CHINA UNITED COALBED METHANE CO. LTD

CUCBM

China United Coalbed Methane Corp. Ltd.

**China's sole backbone CBM enterprise was established in
March 1996**

business scope:

**CBM exploration, development, production,
transportation , sales and utilization.**



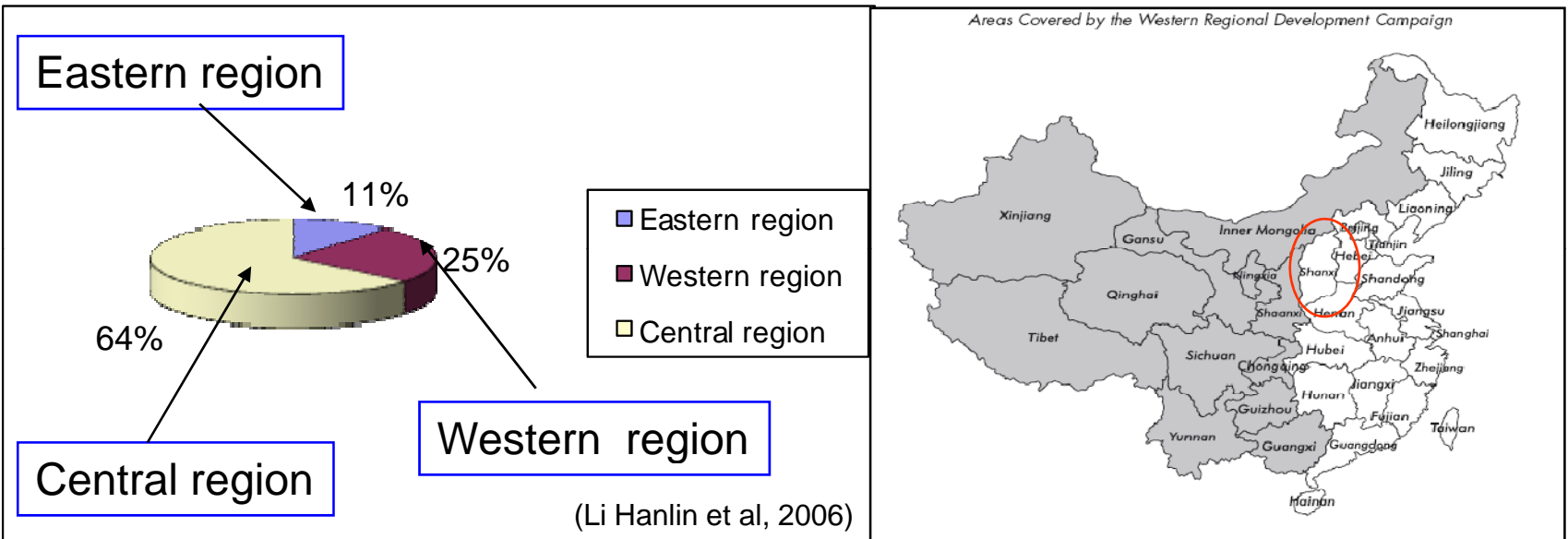


DEVELOPMENT OF COALBED METHANE

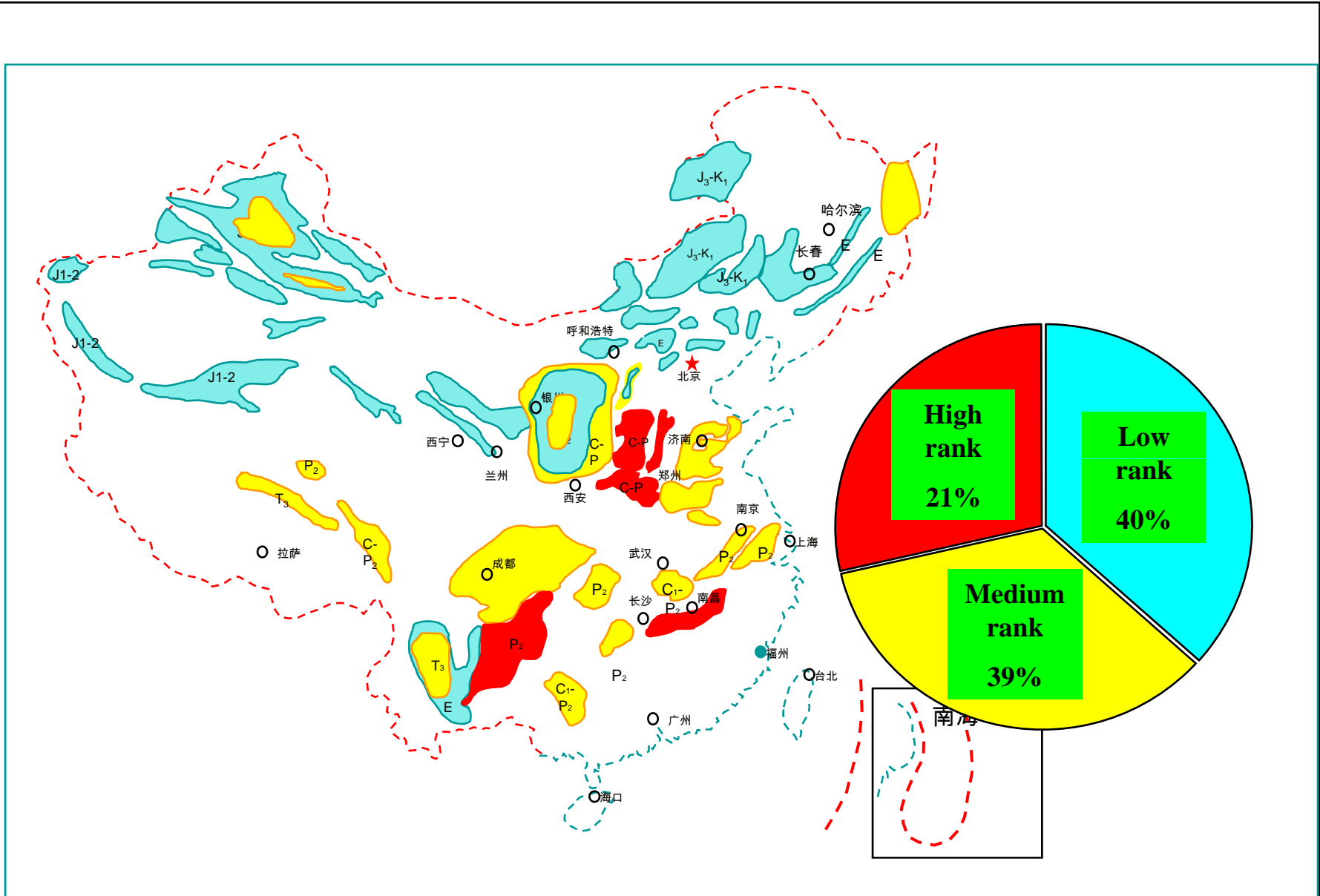
- **Basic research and applied research advance abreast**
- **The exploration direction is clear**
- **The key technologies of CBM exploitation and development highly varied and have been tested**
- **Popularized and applied to a wider field**
- **The CBM industry in China has moved into the stage of commercialization**

DEVELOPMENT OF COALBED METHANE

● Imbalanced geographical distribution

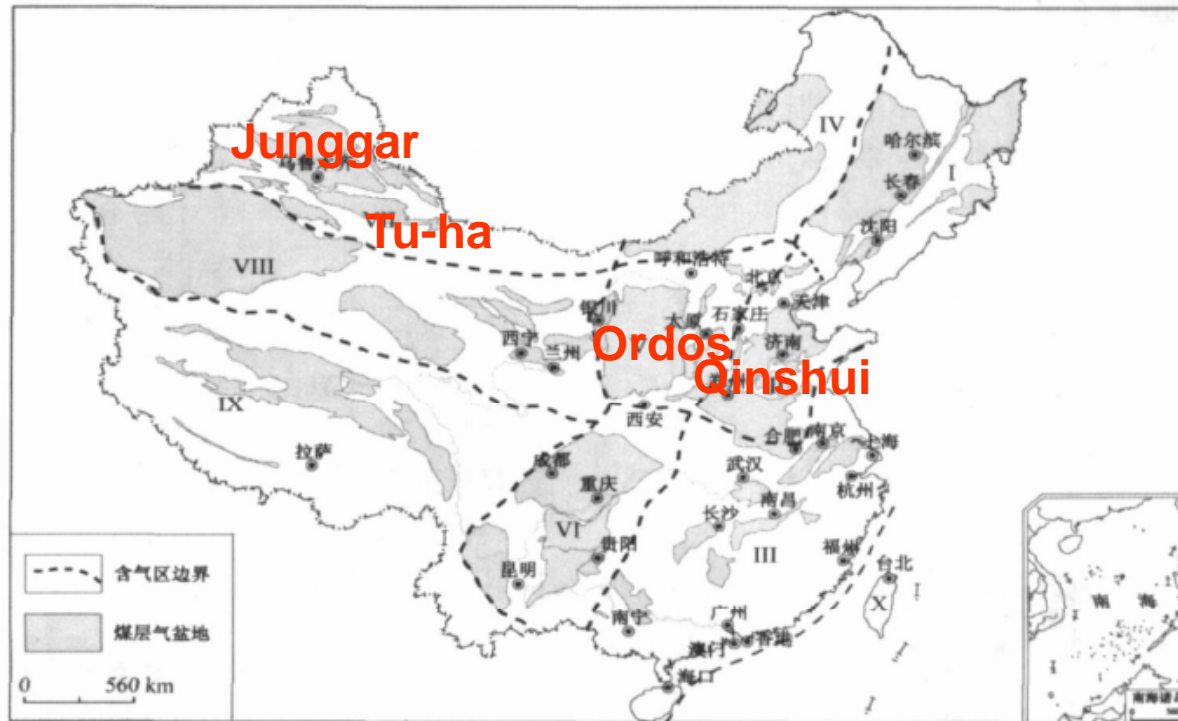


➤ The resources in west, central, and east China are about 25%, 64% and 11%, respectively



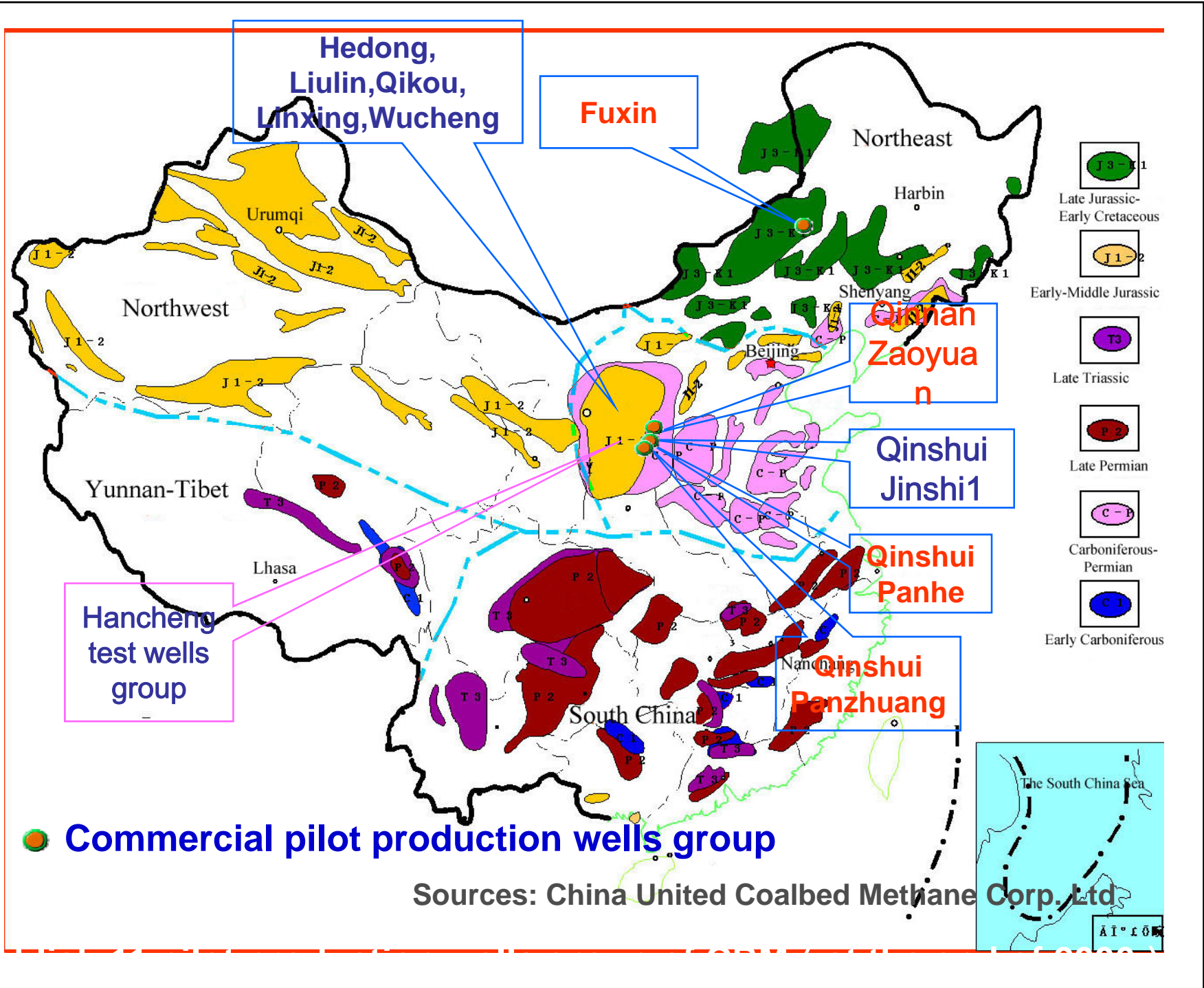
Different coal-forming ages: C-P Carboniferous - Permian
 J₁₋₂ Jurassic

DEVELOPMENT OF COALBED METHANE



Basin	Technically recoverable resources (10^8m^3)	Percentage
Ordos	42346.78	30.5
Qinshui	15939.60	11.5
Turpan-Hami	14275.56	10.0
Junggar	13263.96	10.0







DEVELOPMENT OF COALBED METHANE

- **1843 CBM wells were drilled up to 2007**
- **25 Multi-branch horizontal wells**
- **479 production wells, $115 \times 10^4 \text{m}^3/\text{d}$, $3.8 \times 10^8 \text{m}^3/\text{a}$**
- **Multi-branch horizontal wells: $1 \sim 10 \times 10^4 \text{m}^3/\text{d}$**
- **The average single well output reached $2000 \text{m}^3/\text{d}$**
- **CUCBM and PetroChina have together built a production facility with a capacity of 1 billion cubic meters per year in Qinshui basin**



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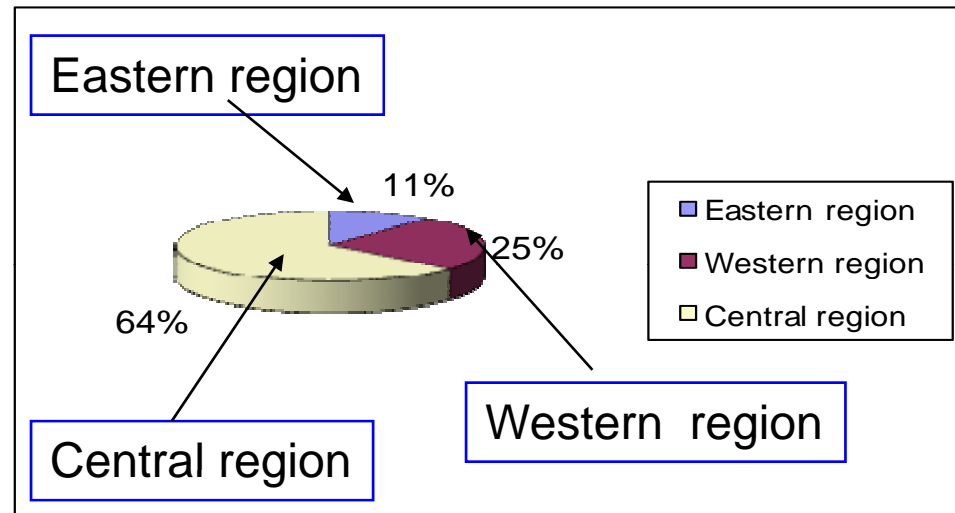
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CHALLENGES AND CHANCES

● Imbalanced geographical distribution



- Most of the CBM basins are far from the economically developed areas and they lack infrastructure
- The eastern region, which accounts for 40% of the country's total population, makes up 60% of the GDP. Its per capita GDP is twice that of the central region and three times that of the western region.



CHALLENGES AND CHANCES (continue)

● Reducing the number of gas explosions in coal mines and methane emissions

The production and use of it could also be helpful to avoid coal mine accidents as well as reducing the emission of methane, a major type of greenhouse gas

China reported 898 deaths in 236 accidents from January to November , 2007, 57 fewer accidents than in the same period the previous year, down 19.5 percent, and the death toll was down 312 persons or 25.8 percent,



CHALLENGES AND CHANCES (continue)

► The West-East Pipeline



West-East pipeline was put into commercial operation in 2004

Starting from the Tarim Basin in Xinjiang and arriving in Shanghai; Creates opportunity for CBM development

The pipeline extending 4,000 km traverses 10 provinces, autonomous regions and municipalities with designed annual gas transmission capacity of 12 billion cubic meters, which can ensure a stable gas supply for 30 years.





CHALLENGES AND CHANCES (continue)

- **Environmental challenges**

- **Coal accounts for 72% of China's primary energy consumption. Raw coal is burned directly, causing serious environmental problems**
- **Coalbed methane will play a major role in sections of large coal consumption such as power generation and residential use**



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ISSUES

**National plan (the 11th Five-year plan, 2006-2010):
Growth of China's GDP at an average annual rate of 7.5%.
The high-speed economic development will be
characterized by booming energy demand**

**The government stresses the importance of developing our
own energy resources and plans to meet most of the
country's future energy demand**



ISSUES (continue)

● Increase investment

- Invested 2.4 billion yuan (300 million U.S. dollars) in coal-bed methane exploration
- Completed the drilling of 1843 wells
- A series of preferential policies have been issued by the government to encourage development and use of coalbed methane, including those in **taxes, financial supports and mining charges**



ISSUES (continue)

- **China plans to build nine transmission pipelines for coal-bed methane**

- **China plans to increase its annual coalbed gas output to 10 billion cubic meters in 2010**
- **40 billion cubic meters in 2020**
- **nine transmission pipelines for coalbed methane with a total length of 1,390 kilometers and a designed transmission capacity of 5.73 billion cubic meters**



ISSUES (continue)

● Expanding Co-op

- According to statistics, by the end of April 2006, 16 foreign companies had signed 27 products-sharing contracts on coalbed methane with domestic enterprises, with an actual investment of 180 million U.S. dollars
- Several large foreign companies, such as Royal Dutch Shell Plc, South Africa-based Sasol Ltd., General Electric (GE), ABB Group and Siemens AG, have worked with Chinese companies to produce electricity and substitutes for crude oil derivatives from coal.



ISSUES (continue)

- **China has launched a coalbed methane liquefaction project that boasts the country's largest daily production capacity**
- **Sasol Ltd., which has commercially-proven coal-to-liquids (CTL) technology, a sort of indirect liquefaction technology, planned to develop two CTL plants in cooperation with China's Shenhua Ningxia Coal Group (SNCG) and Shenhua Coal Group, each with a capacity of about 3 million tons of coal-turned oil per year**
- **Large coal chemical projects involving about 6 billion U.S. dollars of investment are expected to start in China's coal-rich western regions, including Ningxia, Shaanxi and Shanxi, according to local economic planning agencies**



ISSUES (continue)

- **During the Second U.S.-China Strategic Economic Dialogue, the two nations nailed down plans to develop 15 large coal-bed methane capture projects involving six U.S. companies and China United Coal-bed Methane Corporation**
- **In the coming five years, China will make major advances in rational utilization of coal . Foreign companies willing to invest in China might gain big profits with a small capital**



ISSUES (continue)

- **China would set up two national coalbed methane engineering research centers in a move to boost the coalbed methane industry; plan to run 10 demonstration projects**
- **Increase the country's coalbed methane proven reserves by 300 billion cubic meters in 2010**
- **Aims to establish a complete industrial system for coalbed methane development and use**



- **China's CBM industry- great potential**
- **Unprecedented rapid development stage**

THANK YOU