



Barriers and Opportunity for Unconventional Natural Gas Development in China

Sang Fengyun,
China Coal Information Institute
Tel:0086-10-84657905
Email: Sangfy@coalinfo.net.cn

2014 APERC, Tokyo



Main Contents

1. Summary

2. The Resources and Distribution of UNG

3. The Current Status of UNG

4. Preferential policies for UNG

5. The 12th Five Year Plan on UNG

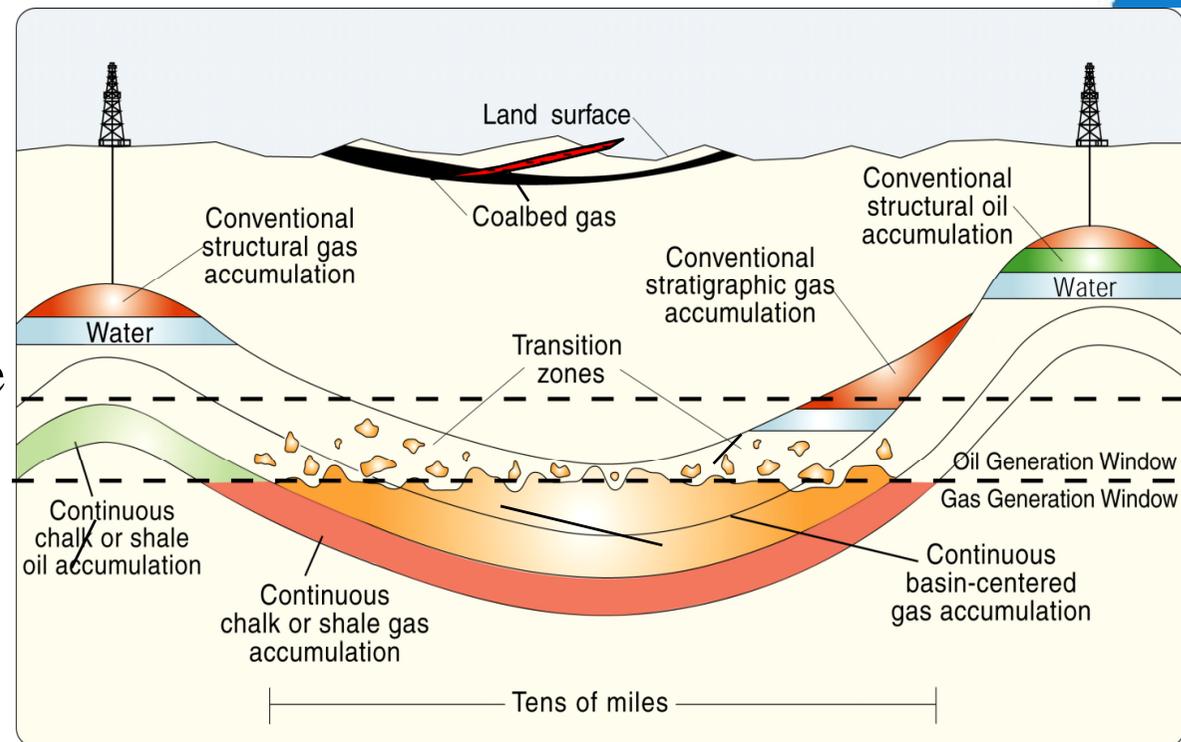
6. Conclusions



1. Summary

➤ Unconventional Natural Gas

- ◆ Tight sand gas
- ◆ CBM
- ◆ Shale GAS
- ◆ Natural Gas Hydrate



1. Summary

➤ Conversion process of unconventional natural gas and natural gas

Unconventional Natural gas development is a process concept, which can be active in under four circumstances.

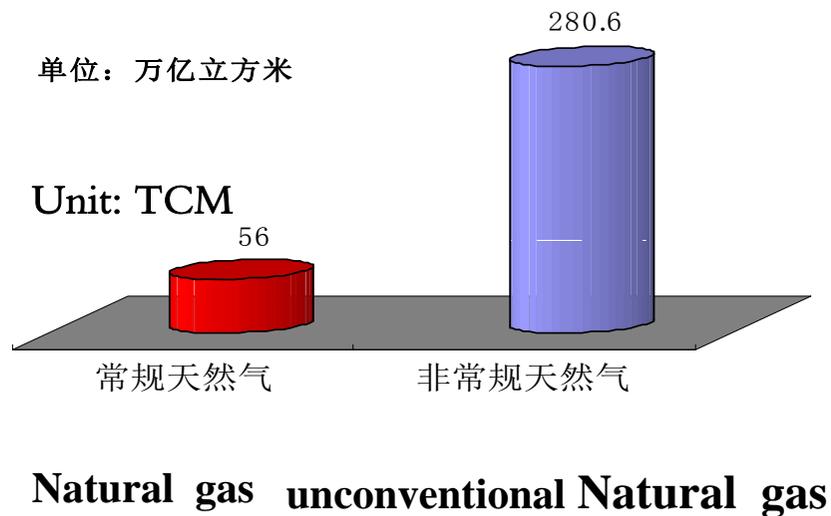
1. The main development technologies reach conventional level.
2. The development approach with the scale, intensive properties.
- 3 Oil prices from \$ 60 to \$80
- 4 “the post-oil age”, exploitation of oil resources decrease.



2. The Resources and Distribution of UNG

2.1 The total resources of unconventional Natural gas

Unconventional natural gas (containing only tight sand gas, CBM, shale gas and natural gas hydrate) is 5.01 times more than conventional natural gas resources



Name	Resources(10^{12}m^3)
CBM	36.8
Sale Gas	100.0
Tight Sand Gas	12.0
Natural Gas Hydrates	131.8



2. The Resources and Distribution of UNG

➤ **Distribution and characteristics**

The geological feature of unconventional natural gas

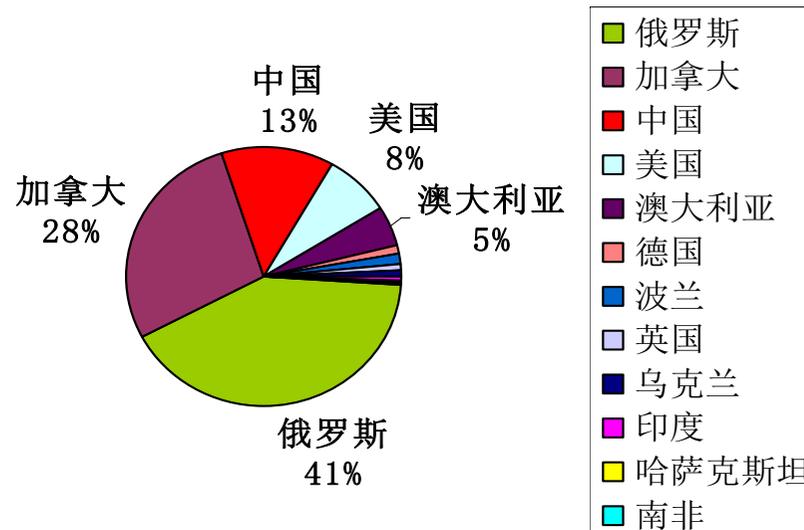
- (1) Widely distributed in north, center and south.
- (2) Composite strata of deep, medium and shallow.
- (3) Both continental and marine sedimentation.
- (4) Complexity reservoir properties.
- (5) Generally coexistence with conventional oil and gas



2. The Resources and Distribution of UNG

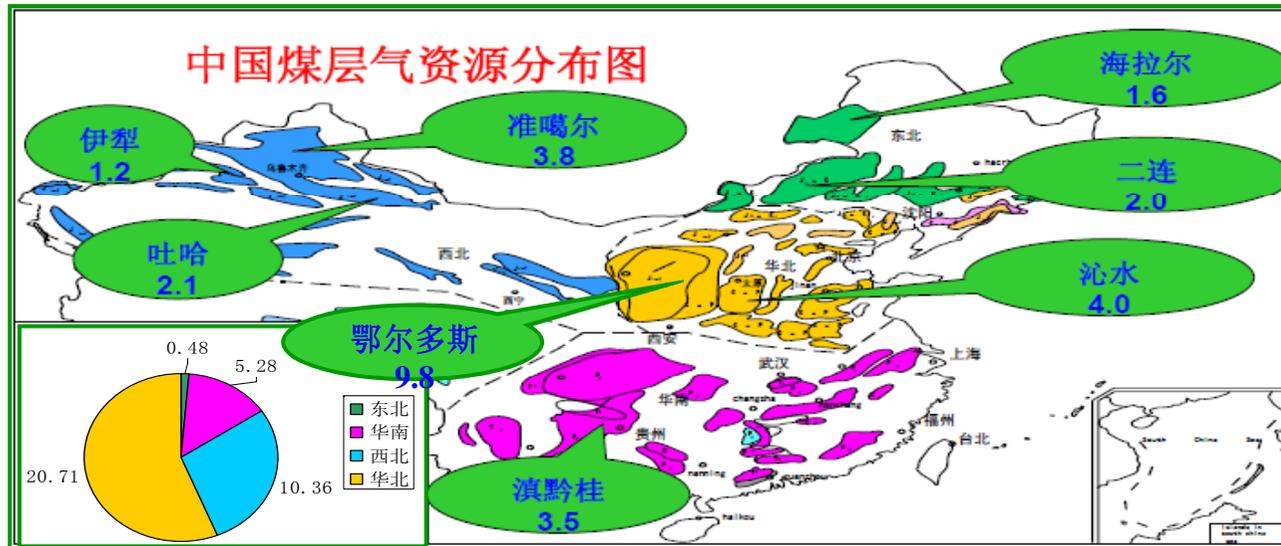
2.2 The resources and distribution of UNG

36.8 trillion m³ of CBM resources are contained in coal fields in depth of above 2000m, as much as the total amount of conventional natural gas resources in China (35 trillion m³). CBM resources in China are only less than those in Russia and Canada, taking the third position in the world.

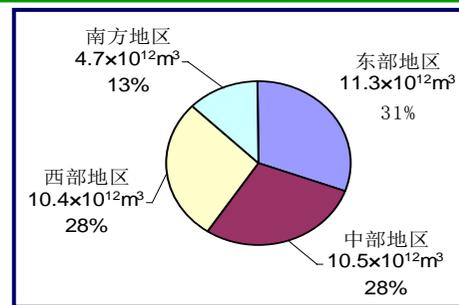


2. The Resources and Distribution of UNG

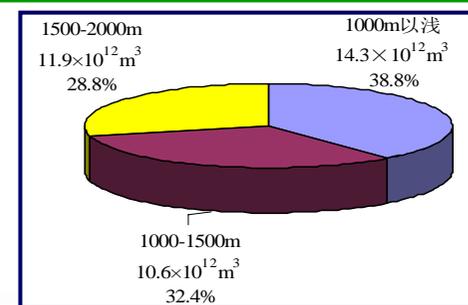
➤ Distribution Character of CBM



The Figure of different district



The Figure of different depth



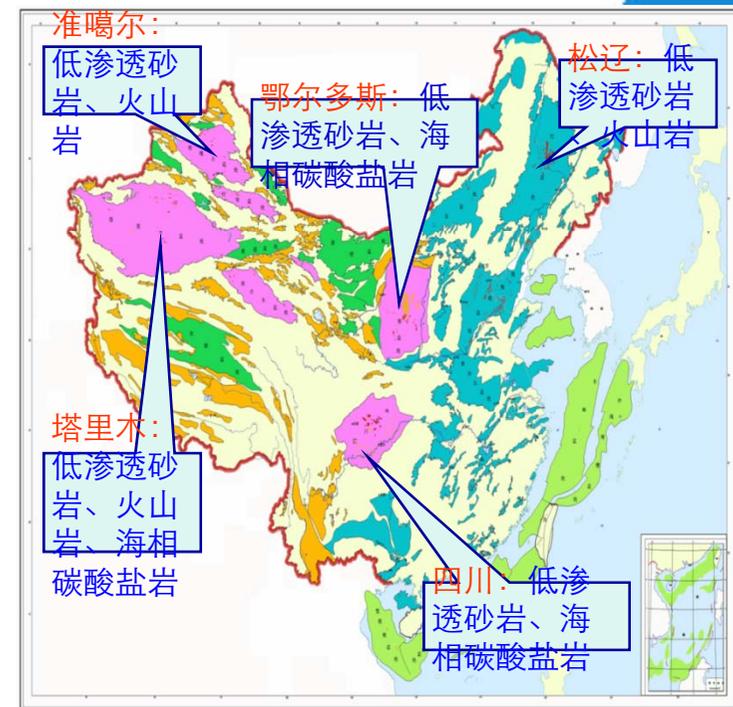
Geographical distribution of CBM Resources



2. The Resources and Distribution of UNG

The resources and distribution of tight sand gas

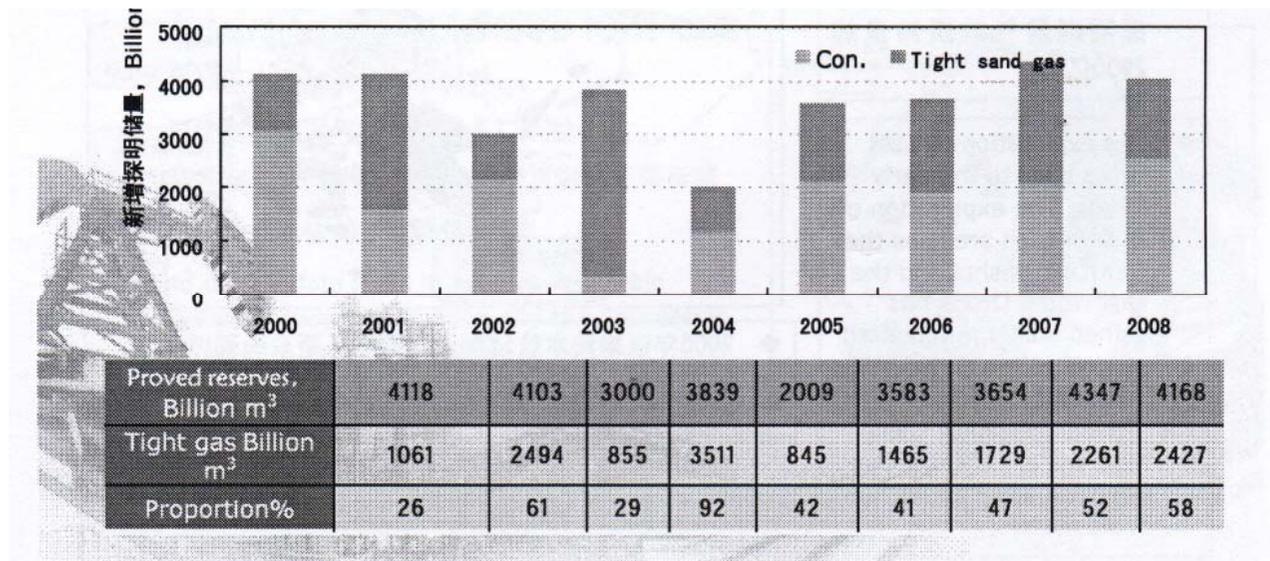
The tight sand gas is about 12 TCM (some with conventional gas resources on existence), widely distributed in more than 10 basins, such as Ordos, Sichuan, Songliao, Bohai Bay, Qaidam, Tarim and Junggar, etc. Ordos and Sichuan Basin are most abundant.



2. The Resources and Distribution of UNG

2.3 The resources and distribution of tight sand gas

By the end of 2011, cumulative proved geological reserve of tight sand gas is 3.3 TCM in China.



2. The Resources and Distribution of UNG

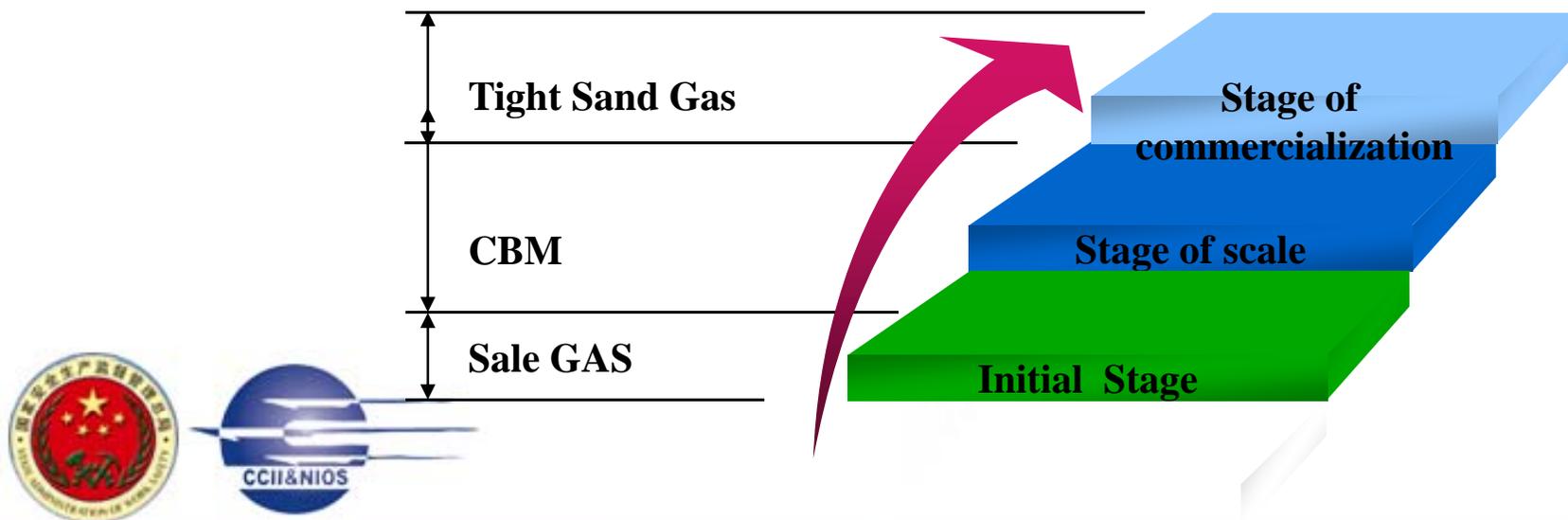
2.3 The resources and distribution of shale gas

- Shale gas resources are widely distributed in marine and continental marine basin
- Shale gas resources can exist at various geological history in china.
- China marine sedimentation area is 3 million square kilometers, of which is 2.8 million square kilometers on shore.
- According to CNPC Research results in 2009, Chinese shale gas resources is 100 TCM.
- Shale gas resources in favorable areas is about 30 TCM



3. The Current Status of Unconventional Natural Gas

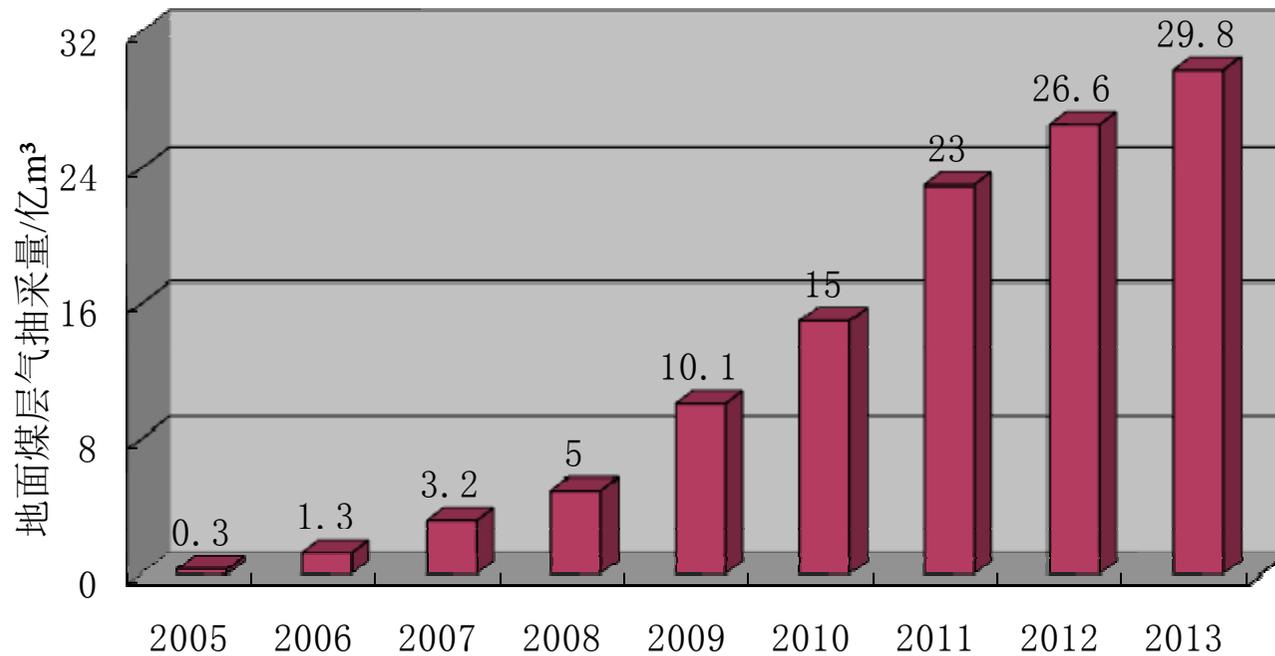
- CBM development has reached certain stage and will enter stage of scale and commercialization in the next step.
- Tight sand gas development has entered the development initial stage of scale
- Exploitation of shale gas is still in the introduction, exploration stage.



3. The Current Status of Unconventional Natural Gas

3.1 The current status of CBM

- CBM production from surface wells
 - Produced 2.98 billion m³ of CBM in 2012.

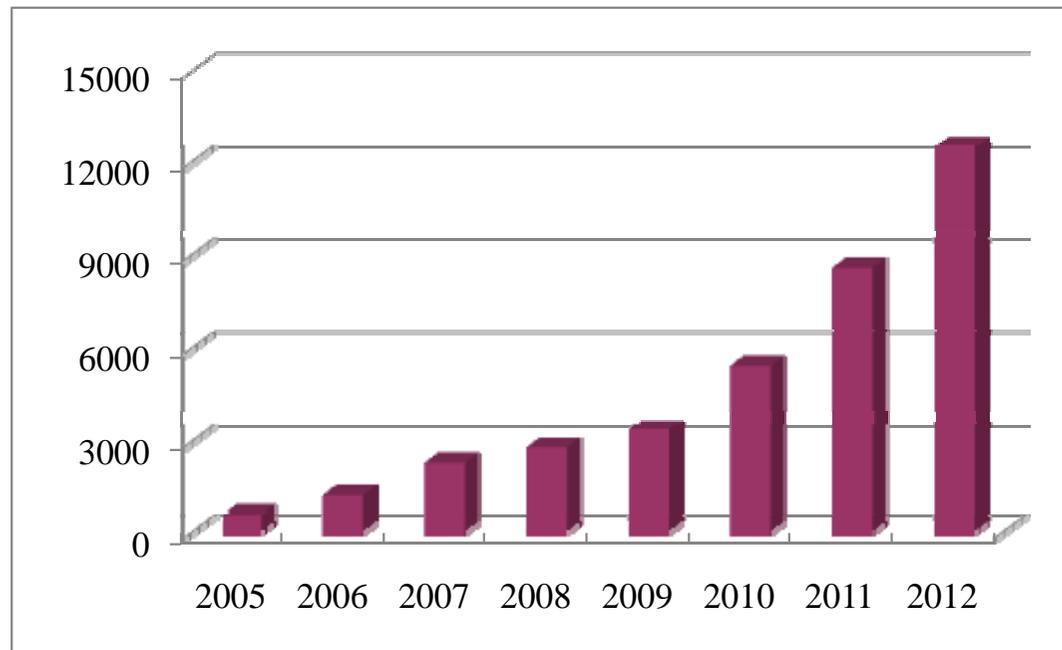


CBM production from 2005-2013 in China



3. The Current Status of Unconventional Natural Gas

- Accumulative numbers of CBM surface well
- By the end of 2012, Accumulative number of CBM surface well is 10,547.

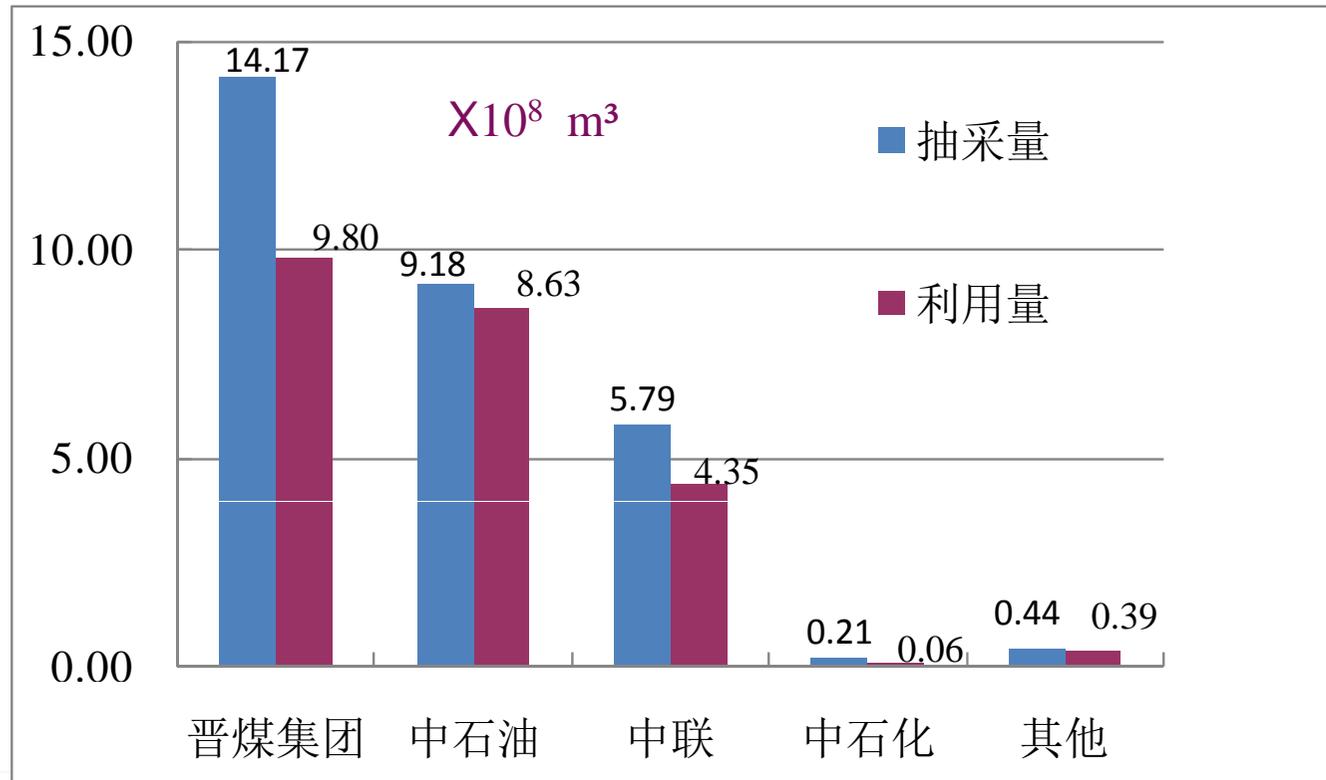


Accumulative numbers of CBM surface well from 2005-2012 in China



3. The Current Status of Unconventional Natural Gas

■ Main CBM Development Companies



CBM production and utilization in 2013 in China



3. The Current Status of Unconventional Natural Gas

- Jincheng Anthracite Mining Group (JAMC) is the largest CBM development company in China. Drainage volume and utilization volume of CBM in JAMC separately 1.42 Bm³ and 0.98 Bm³.
- JAMC constructed 583 CBM wells in 2013. And the accumulative number of CBM well is 4905.



3. The Current Status of Unconventional Natural Gas

- Status Quo of CBM Development by Coal Rank
 - Exploration and development of CBM from high rank coal has a breakthrough, and it has realized industrial development in the southern of Qinshui Basin.
 - CBM Exploration from medium rank coal only has a breakthrough in the east of Ordos Basin, and the output of CBM is 100 Mm³ in 2012.
 - So far, CBM resources from low rank coal don't make a breakthrough and only attain better efforts in Baode district of Shanxi Province. And pilot project of CBM development from low rank coal achieves success in Yilan City of Heilongjiang Province.

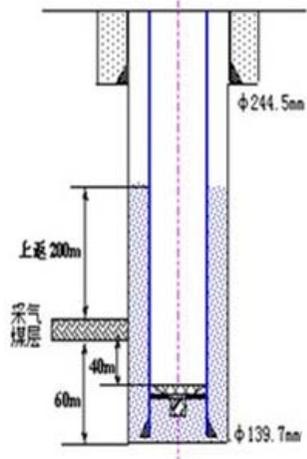


3. The Current Status of Unconventional Natural Gas

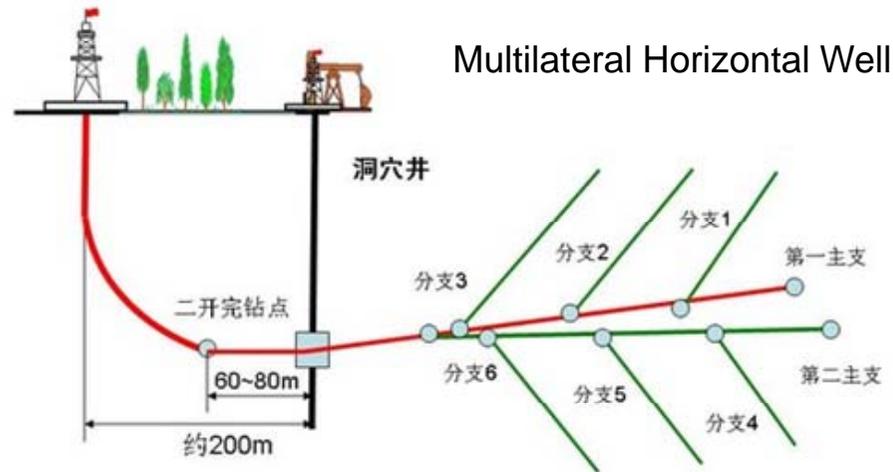
- Main CBM recovery technologies in China
 - Surface vertical wells in virgin coal basins.
 - Gob wells in active mining area with increased permeability.
 - Multi-lateral horizontal well.
 - Butted well.
 - CBM drainage by combination of surface well and underground drilling
 - Stimulation Technology of CBM Well, including fracturing and CO₂ Injection



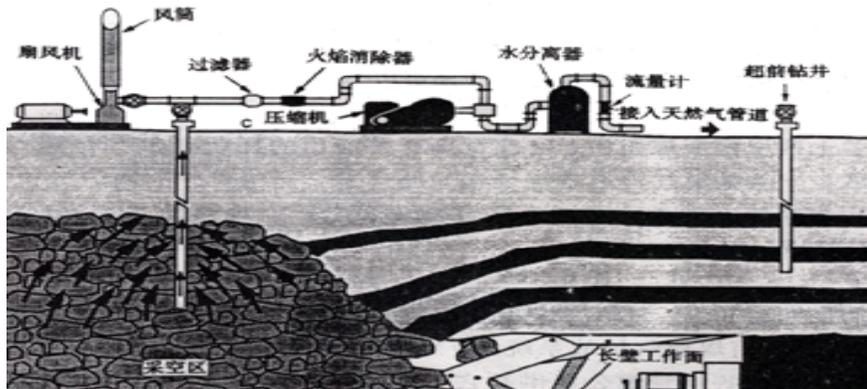
3. The Current Status of Unconventional Natural Gas



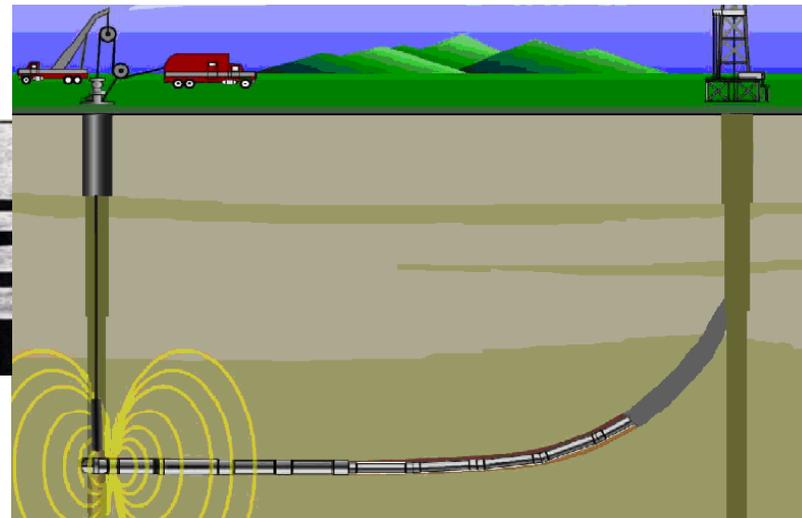
Vertical Well



Multilateral Horizontal Well



Gob well in mining area



Butted Well



3. The Current Status of Unconventional Natural Gas

Main fields of CBM utilization

- Compressed CBM for vehicles fuel
- Liquefied CBM
- Civil use by pipeline transportation



3. The Current Status of Unconventional Natural Gas

- Vehicle fuels

- Currently there are 20 thousands gas vehicles and vehicles that could be driven by gas or gasoline in Jincheng City of Shanxi Province.



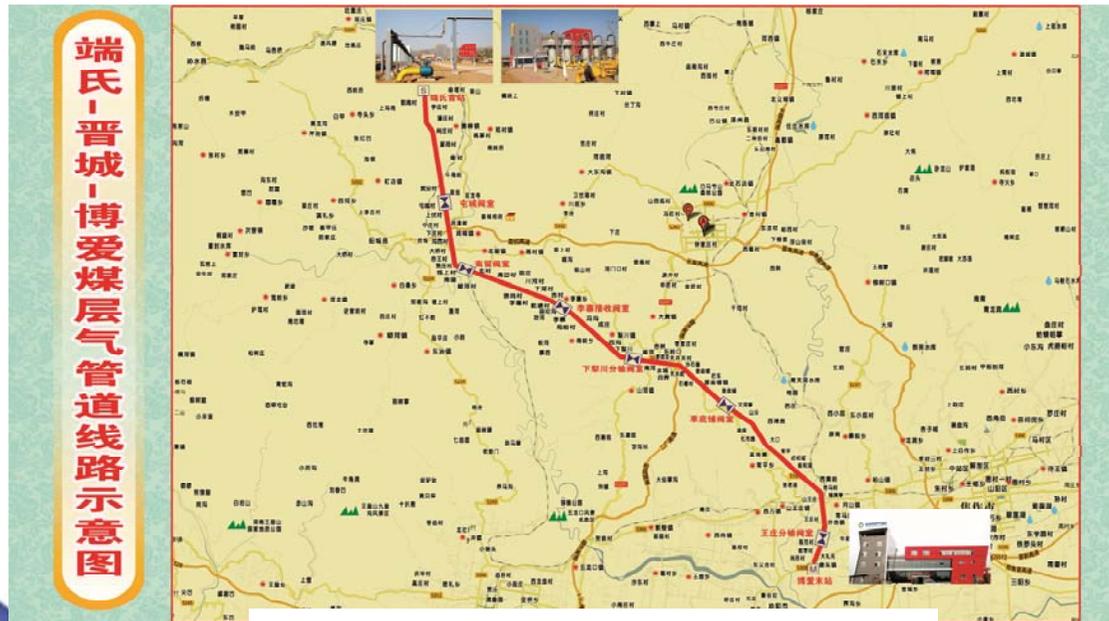
3. The Current Status of Unconventional Natural Gas

- CBM Transportation by Pipeline
 - 5 CBM pipelines have been built, and transportation capacity is 10.2 B m³.
 - 3 CBM pipelines are under construction, and transportation capacity is 3.4 B m³.



3. The Current Status of Unconventional Natural Gas

- CBM Transportation by Pipeline
 - The first trans-provincial CBM pipeline with the total investment of 458 Million Yuan fully completed in June, 2011. The pipeline with gas transportation capacity of 2 billion m³ per year is 98.2 km in length.



Sketch Map of Pipeline Route



3. The Current Status of Unconventional Natural Gas

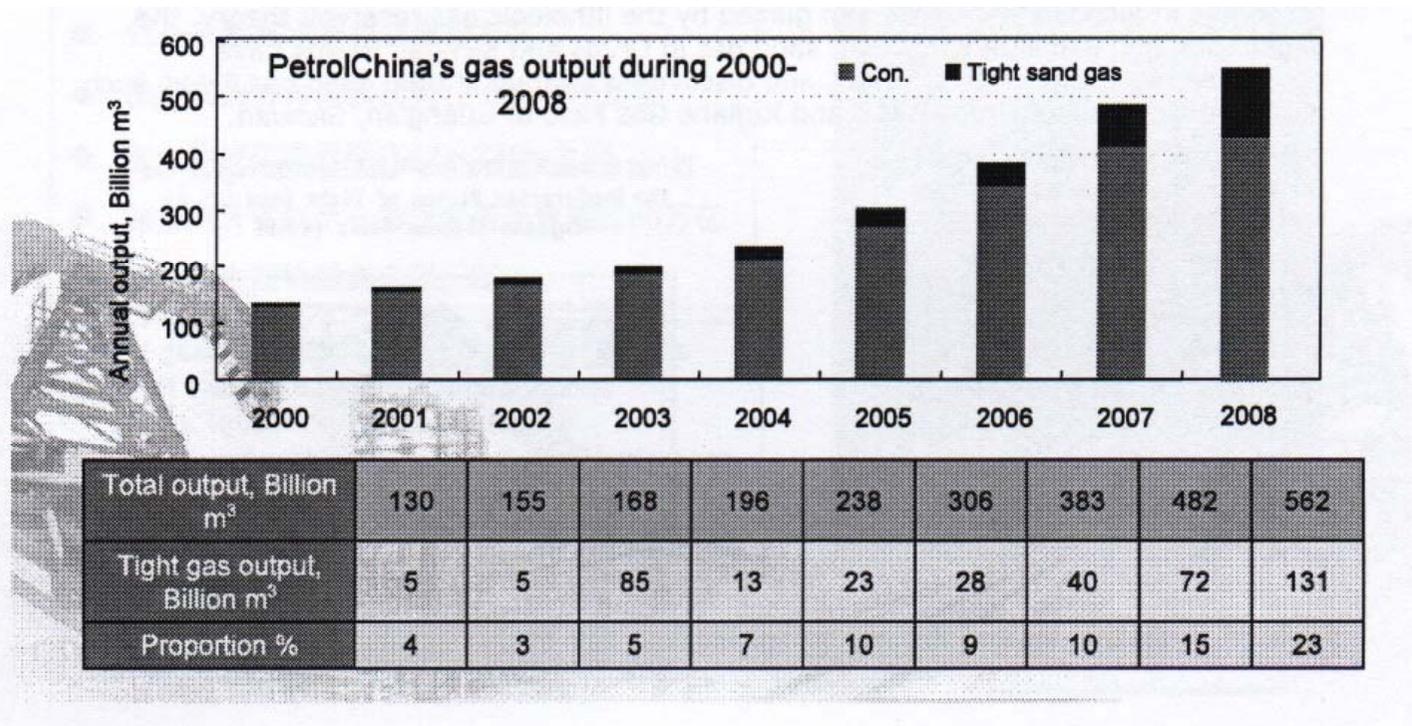
3.2 Current status of tight sand gas

- The development of tight sand gas started from 1970. Sichuan and Ordos gas reservoirs structures are typical
- Since the late 1990, the main developments are large-scale exploration and development of the Ordos Basin and Sichuan. Xujiahe of Guang'an city and a number of tight sand gas field have been found



3. The Current Status of Unconventional Natural Gas

- By the end of 2011, tight sand gas production is over 25 BCM, mainly in Ordos, Sichuan basins.



3. The Current Status of Unconventional Natural Gas

3.3 Current status of shale gas

➤ History

- ❑ 2006-2009: Field exploration, favorite area selection and evaluation
- ❑ 2010-2011 Setting up demonstration areas in Sichuan, deployment exploration wells , evaluation of containing gas
- ❑ 2011-2013 Initial commercial Development in Beiling Area of Chongqing City

➤ The shale production is 0.2 billion in 2013



3. The Current Status of Unconventional Natural Gas

➤ Milestones

- ❑ August 2009, China's first shale gas exploration project was launched in Qijiang County of Chongqing city by Natural Gas Resources Strategic Research Center of Ministry of Land and Resource.
- ❑ November 2009, China first shale gas cooperation projects , "Fushun and Yongchuan Block shale gas project" , was launched in Chengdu city by CNPC cooperated with Shell
- ❑ 2010, two trial shale gas development demonstration area had been built in the Chuandong area Sichuan Basin and Yungui area.



3. The Current Status of Unconventional Natural Gas

➤ Milestones

- ❑ June 27, 2011, Ministry of land and resource organized the first shale gas exploration right bid, CNPC, Sinopec, and China United Coalbed Methane Co. ,Ld., Yanchang oil company, Henan CBM company and other companies attending the bidding.
- ❑ April 2012, Changning and Weiyuan national demonstration area in Sichuan was set by NDRC.
- ❑ September 10, 2012 ,Ministry of Land and Resource conducted second shale gas exploration right bid
- ❑ The Ministry of Land and Resource will conduct the third shale gas exploration in April.



3. The Current Status of Unconventional Natural Gas

➤ Financial Investment

- By the end of March 2012, RMB 7 billion had been invested in shale gas exploration and development, implemented 83 shale gas wells , 28 horizontal wells , 2D seismic exploration of 9,000 kilometers, 3D seismic exploration of 800 square kilometers
- CNPC invested more than RMB 4.0 billion to carry out geological surveys, seismic data acquisition, evaluation well drilling and fracturing test , focus on Changning, Weiyuan and Zhaotong blocks.
- Sinopec has completed 2D seismic exploration of 4505 km, implemented 26 shale gas wells (17 horizontal wells), 23 finish drilling wells (15 horizontal wells), completed drill length of 80,100 meters, completed investment RMB 2.3 billion



3. The Current Status of Unconventional Natural Gas

➤ **Finical Investment**

➤ Yanchang Oil Company had drilled 24 shale gas wells, of which are 19 vertical wells, three cluster wells, 2 horizontal wells ; complete 14 fracturing wells , of which is 13 vertical fracturing wells, 1 horizontal fracturing , the fracturing shale were wells got gas flow

➤ CNOOC completed 2D seismic of 250 km, drilled 4 parameter wells with total drill length is 1,670 meters

China United CBM company had completed 3 parameter wells, with a total drill length of 4,100 meters

Henan CBM company had drilled 1 3 parameter wells with depth 546 m, completed 2D seismic of 523.5 km



4. Preferential policies for Unconventional Natural Gas

4.1 Financial Subsidy of CBM

- Financial Subsidy
 - 0.2 Yuan/m³ from Central Gvt., and Local Gvt. An give some subsidies.

- Price
 - Price should be determined in consultation 。
 - Not to enter the city gas grid: consultation; enter grid: refer to calorific heat value compared with the NG.



4. Preferential policies for Unconventional Natural Gas

■ Preferential Tax

- Exempt prospecting, mining right fee, don't levy resources tax till 2020
- Levy First and return later for VAT on CBM/CMM sale. Don't levy income-tax if return VAT spent on tech. research and enlarging production
- Accelerate the depreciation of special equipment



4. Preferential policies for Unconventional Natural Gas

- Tax credit from income tax increment to last year by 40% investment of loans or own funds spent on purchase the equipments made in China
- 50% cost of research on new tech. or process is allowed to deduct from the sum before income tax
- To exempt tariff and import-related VAT for equipments, instruments, spare parts, tools that can't be produced in China.



4. Preferential policies for Unconventional Natural Gas

4.2 Financial Subsidy of Sale Gas

- ❑ Ministry of Finance and the National Energy Administration jointly issued a shale gas subsidy policy
- ❑ During The Twelfth Five-Year period , the use of shale gas can be get subsidy of RMB 0.4 yuan per cubic meter
- ❑ Establish national Shale gas R & D Center
- ❑ Ministry of Land and Resource issued public bid to all types of investors for shale gas exploration right.



5. The 12th Five Year Plan on Unconventional Natural Gas

- 5.1 Development and utilization of CBM/CMM during the 12th Five Year Plan
 - By the end of 2015 CBM production will be 16 Billion m³, almost of it will be utilized; drainage resource of CMM will be 14 Billion m³, and utilization rate will be over 60%.
 - Installation capacity of power units will surpass 2850 Mw, and civil use will surpass 3.2 Million households.



5. The 12th Five Year Plan on Unconventional Natural Gas

The 12th Five Year Plan objectives

- Completing national potential investigation and evaluation of shale gas
- 30 to 50 shale gas prospective areas and 50 to 80 favorable target areas will be preferably selected.
- Proven geological reserves of shale gas reach 600 BCM, recoverable reserves is 200 BCM.
- Production of 6.5 BCM of shale gas in 2015 .



6. Conclusions

- Clean energy demand continue to increase in China, natural gas gaps will persist for a long time
- Unconventional gas resources is abundant in China, which supplement natural gas gaps
- Unconventional gas technology continues to progress, which promote rapid development of CNG
- Energy enterprises attach importance to unconventional natural gas business, which become the 12th Five Year strategic development focus.



CII and its work scope

- About CCII
 - National research organization with 600 staff, established in 1959.
 - Scope of work
 - Coal
 - Energy
 - Environment
 - Occupational safety and health



CCII's CBM/CMM Projects and Achievement

- The China CBM Clearing House was set in 1994 under assistance of EPA
- Identification and evaluation of CBM/CMM blocks and database of CBM/CMM
- CBM/CMM projects with financial support of World Bank and Asian Development Bank.
- CBM/CMM projects as contracts to Chinese and foreign companies.
- Participating the Methane to Markets Partnership in 2004. changed title to Global Methane Initiative (GMI) in 2010.



Organizing 2007 Methane to Markets Expo

- ◆ M2M Partnership
- ◆ initiated by USA 2004
- ◆ 4 Sectors
 - Coal
 - Landfill Gas
 - Natural Gas and Oil
 - Agriculture



◆ 830 participants from 34 countries attended the Expo on Oct. 30 to Nov. 1, 2007, Beijing

◆ Co-hosted by NDRC and USEAP, organized by CCII



Thank You!

欢迎访问煤炭信息研究院

Welcome to visit CCI

For more information, please contact us.

Tel:0086-10-84657905

E-mail:sangfy@coalinfo.net.cn

[Http://www.coalinfo.net.cn](http://www.coalinfo.net.cn) or

www.nios.com.cn

