

# 中国煤矿煤层气开发利用项目 前景及鼓励政策

## Great Potential for CBM/CMM Recovery and Utilization and Preferential Policies

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# Outlines

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- 1. CBM/CMM resources in China
- 2. Coal mining and CBM/CMM emission
- 3. Underground CMM drainage
- 4. CBM recovery with surface wells
- 5. CBM/CMM utilization
- 6. Potential opportunities
- 7. Preferential policies for CBM/CMM
- 8. Latest progress of coal mine sector in M2M
- 9. Conclusions

# CCII and its work scope

- **About CCII**
  - CCII was established in 1959.
  - China Coal Information Institute is a leading research institute at national level, with more than 600 quality employees
  - Scope of work
    - **Coal**
    - **Energy**
    - **Environment**
    - **Occupational safety and health**



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## CCII and its work scope

- Experiences in CBM/CMM
  - China Coalbed Methane Clearinghouse established with support of USEPA in 1994
  - CBM/CMM pre-feasibility reports
  - Prefeasibility studies on CBM/CMM projects
  - IPCC report
  - Projects with World Bank and Asian Development Bank
  - Projects with other international organizations, governments and companies
  - Organizing CBM/CMM Conferences

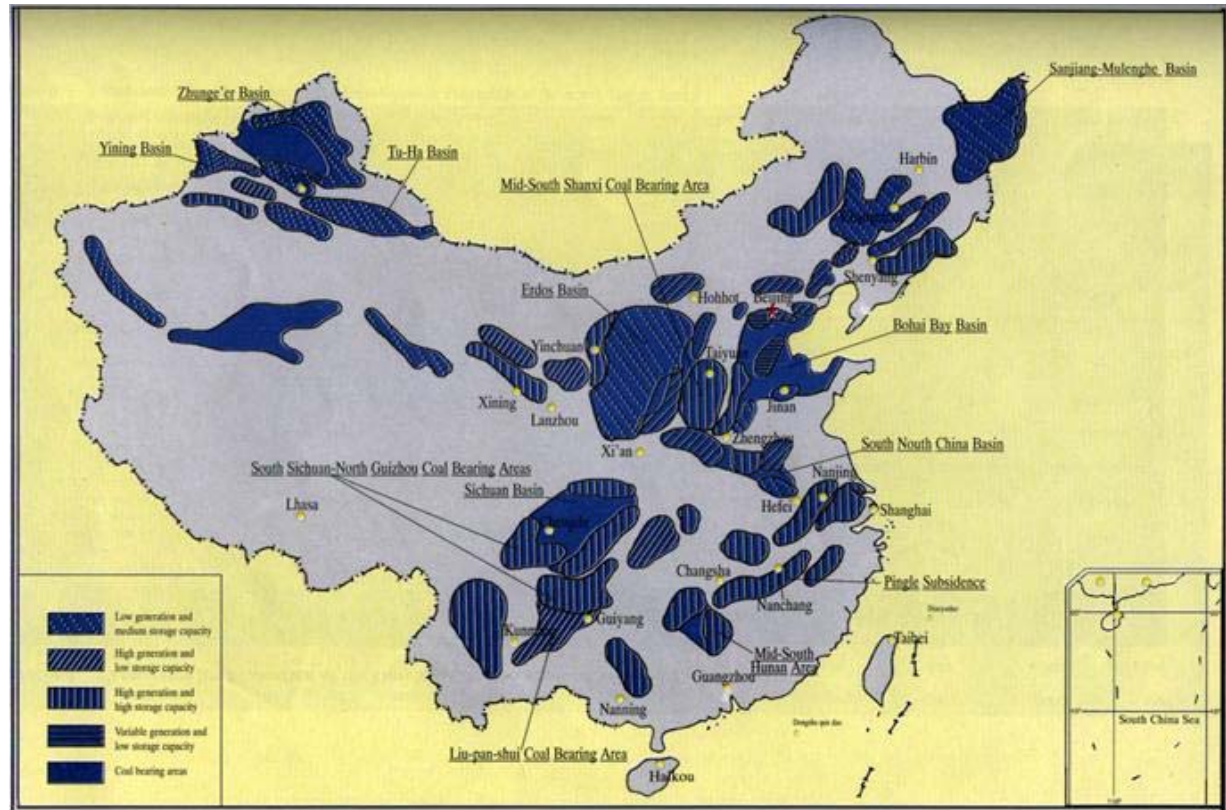
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## 1. CBM/CMM resources in China

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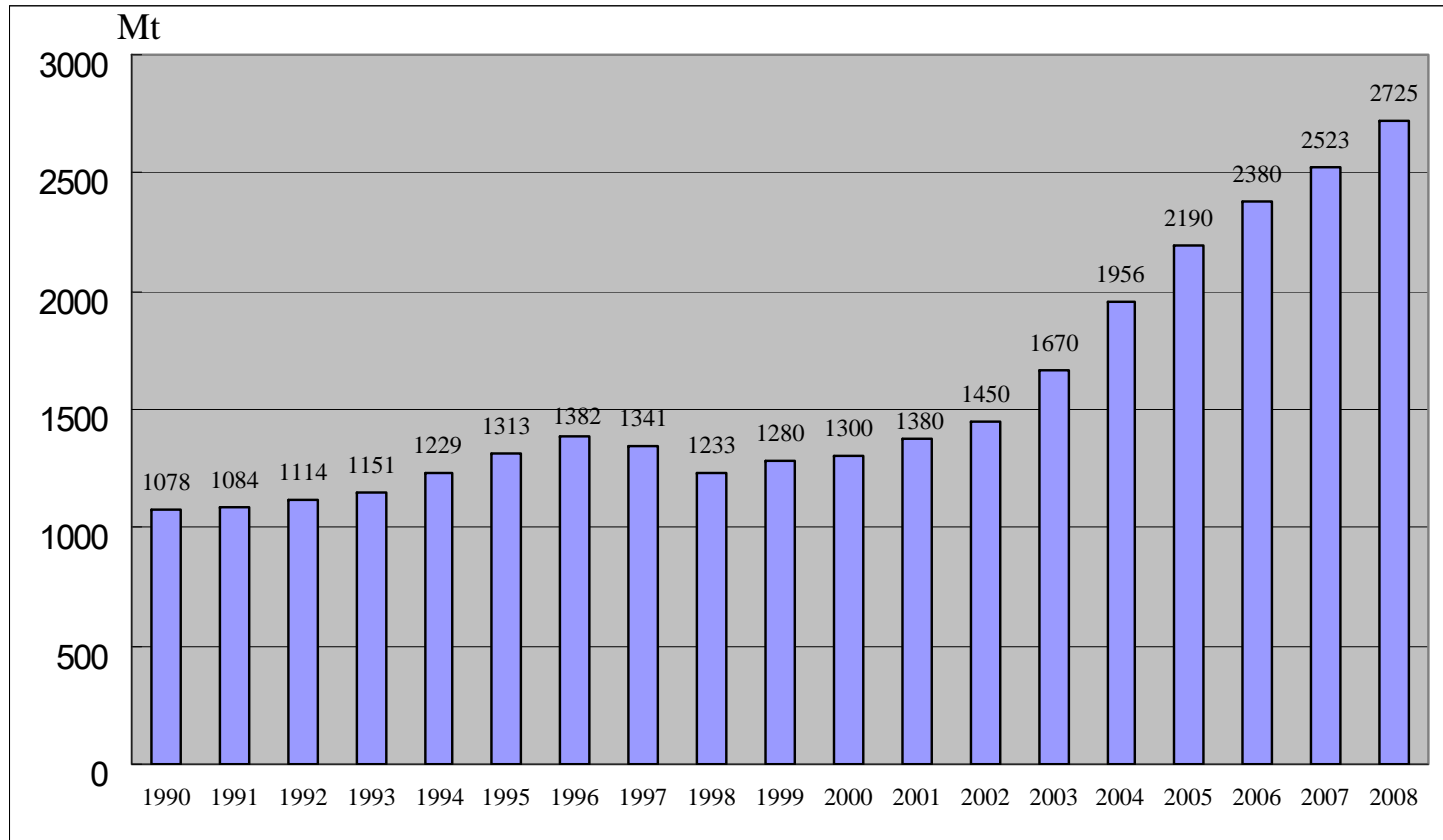
According to reports, 36.8 trillion m<sup>3</sup> of CBM/CMM resources are contained in coal fields in depth of above 2000m, as much as the total amount of conventional natural gas resources in China (35 trillion m<sup>3</sup>).

# 1. CBM/CMM resources in China



Geographical distribution of China CBM/CMM resources

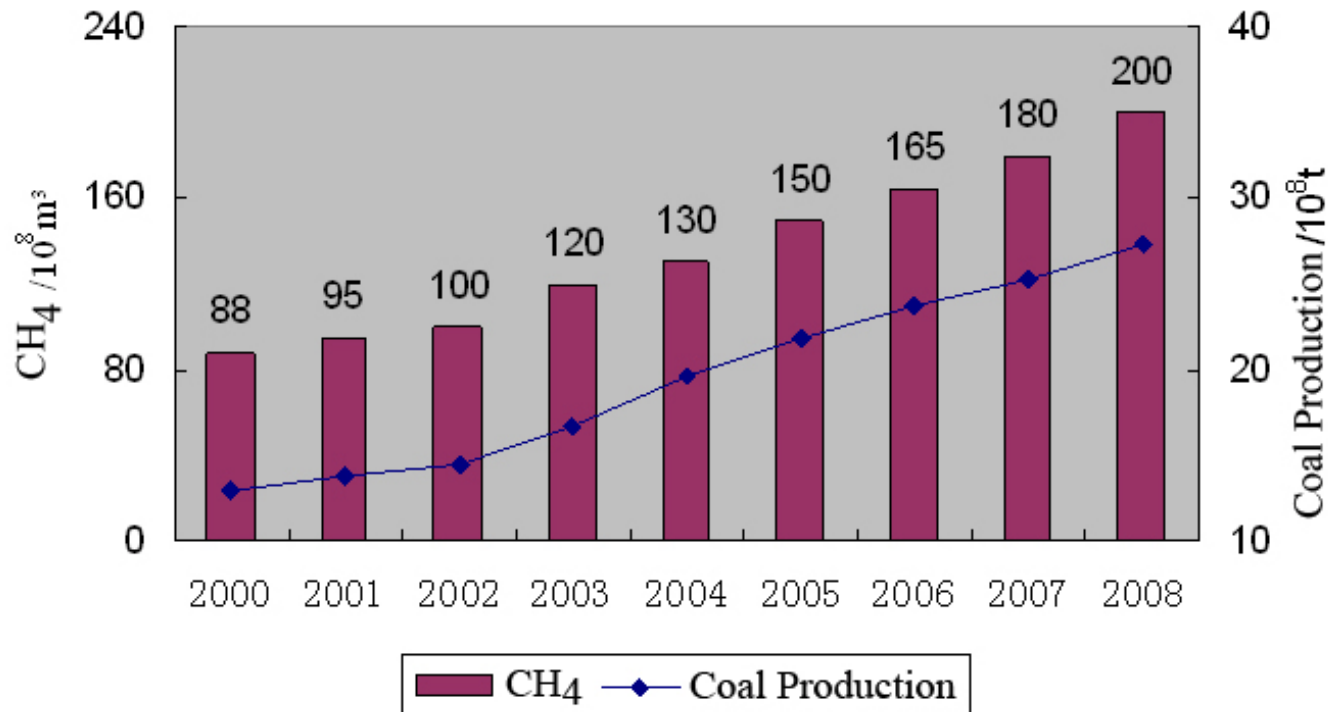
## 2. Coal mining and CMM emission in China



Growth of Coal Production in China

## 2. Coal mining and CMM emission in China

- Coal mine methane emissions has been increasing with increased coal output, emitting 20 billion m<sup>3</sup> in 2008. )

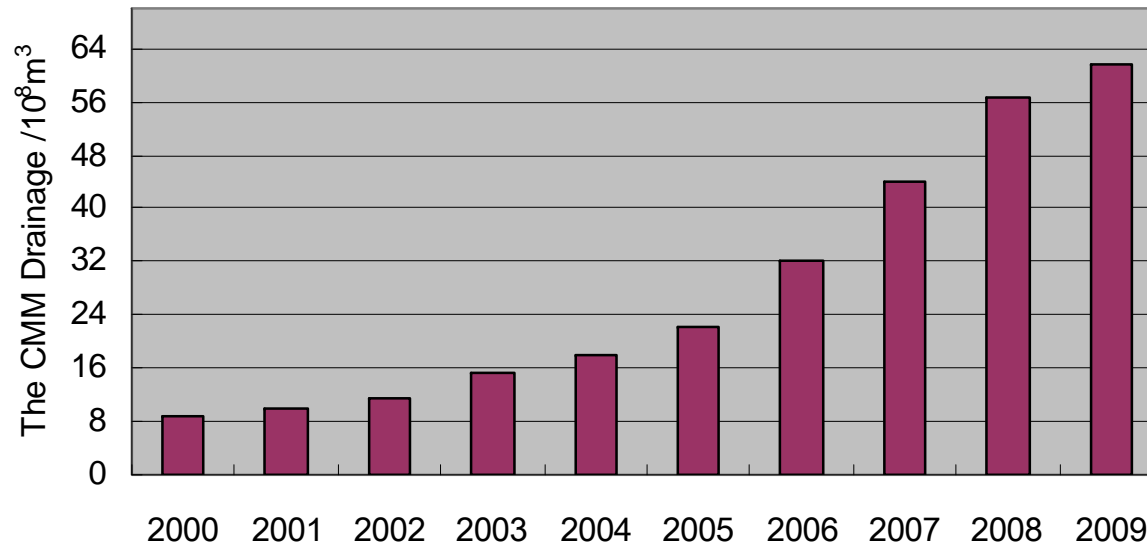


CMM Emissions from Coal Mines in China



### 3. Underground CMM drainage in China

- 6.17 billion m<sup>3</sup> of CMM recovered in 2009.



The amounts of CMM drainage 1998-2009 in China

### 3. Underground CMM drainage in China

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#### ■ **CMM drainage technologies**

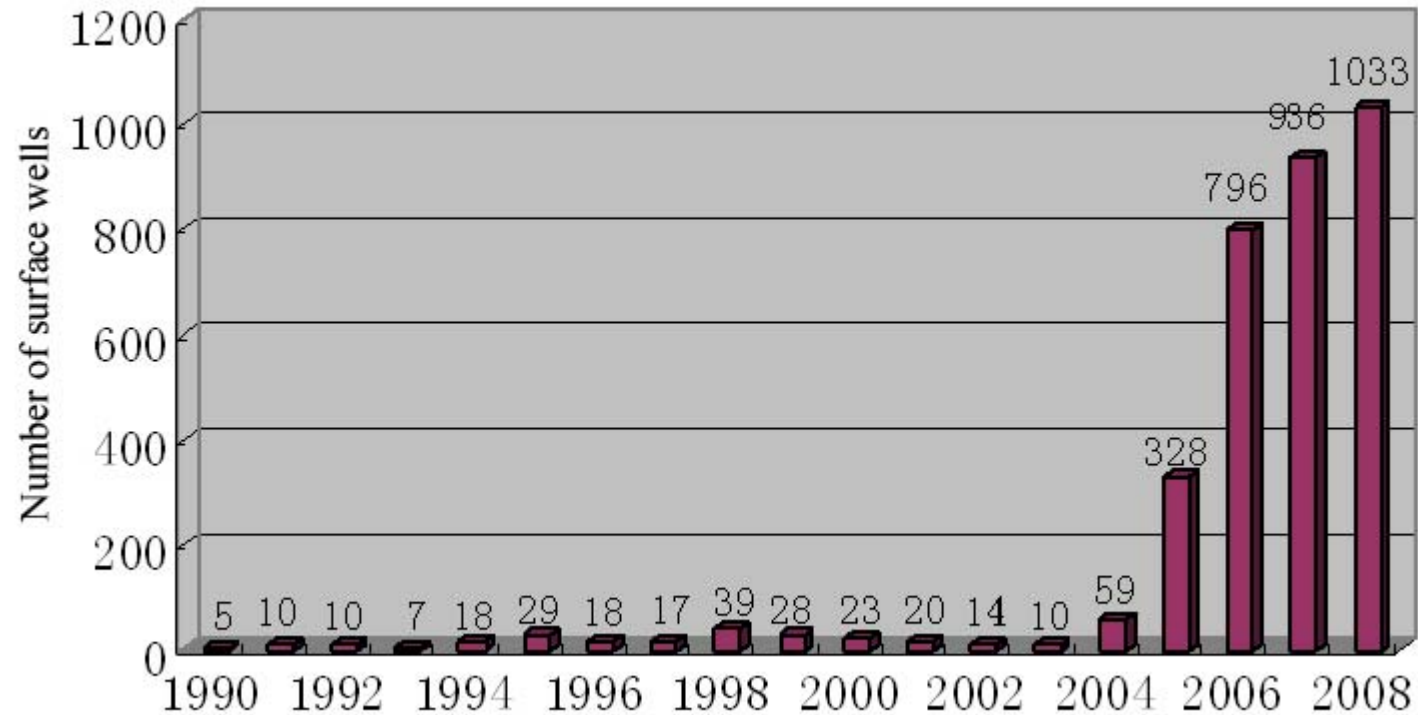
- Horizontal directional drilling
- Across-seam drilling
- Y-Ventilation and CMM drainage system at Huainan mining group
- Underground directional fracturing technology for coal seam with complicated geological structure and low permeability

## 4. CBM Recovery with surface well in China

### ■ **CBM Recovery with Surface Wells**

- Since early 90's in 20century, China began to drill surface wells for CBM recovery.
- By the end of 2008, a total of 3400 wells were drilled in China, and CBM production capacity reached about 2 billion m<sup>3</sup>. Of which, 1453 CBM wells were drilled in Jincheng Anthracite Mining Group with the production capacity of 600 million m<sup>3</sup>. In 2009, the CBM drainage volume reached 376 million m<sup>3</sup> in the Group.

## 4. CBM Recovery with surface well in China



**The number of surface well from 1990 to 2008 in China**

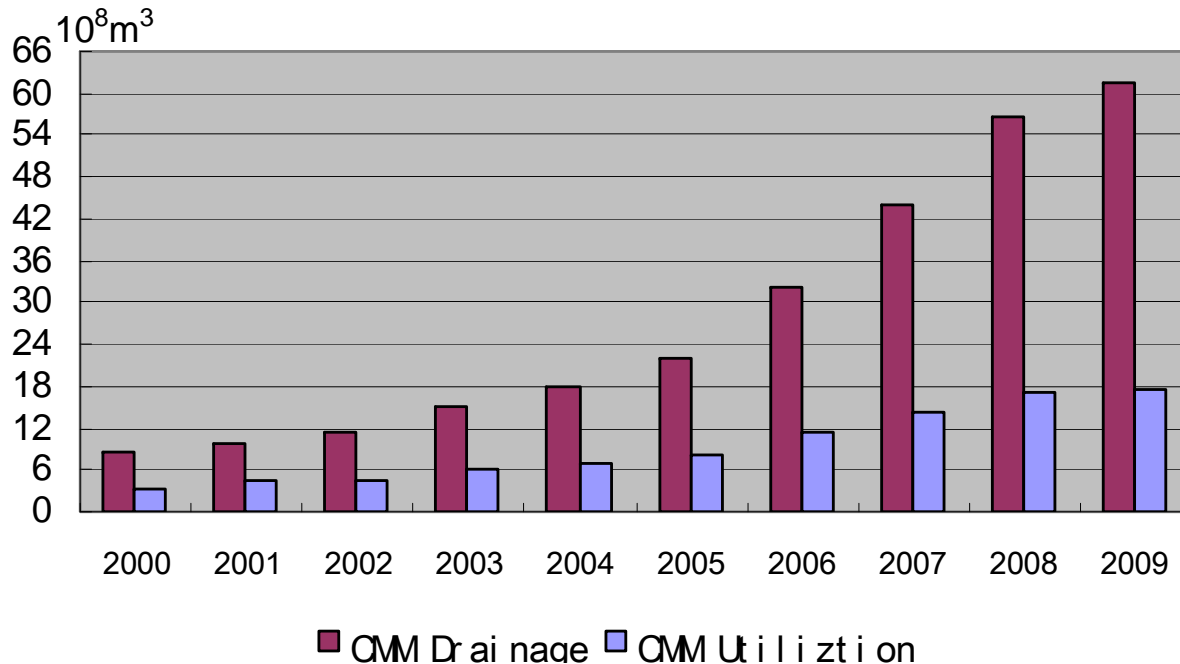
## 4. CBM Recovery with surface well in China

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- **CBM recovery technologies**
  - Recovery CBM before drainage with surface wells
  - Gob wells in active mining area with increased permeability
  - Multi-lateral horizontal drilling
  - Surface hydraulic fracturing
  - Drainage from Abandoned coal mine

## 5. CBM/CMM utilization in China

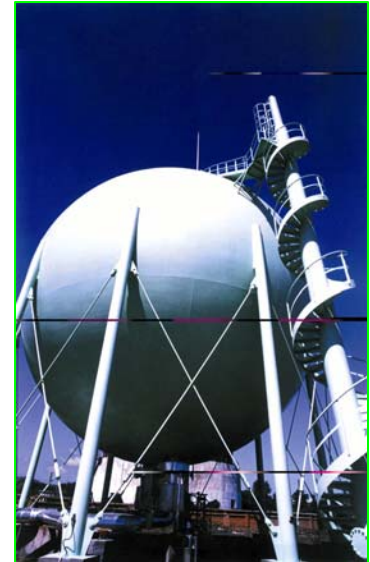
- 2009, utilized 1.718 billion m<sup>3</sup>
- Great potential



Trends of CMM drainage and utilization (10<sup>8</sup> m<sup>3</sup>)

## 5. CBM/CMM utilization in China

- CMM utilization methods: Household fuel, Power generation and chemical materials
  - ◆ Household fuel
    - In 2008 , the number of civil CBM/CMM users in China has reached 0.9 million, and the total length of CBM transmission pipelines was 3200km.
    - In October 2008, the first trans-provincial CBM long distance transmission pipeline project with the designed annual gas supply capacity of 1 billion m<sup>3</sup> was approved by NDRC.



## 5. CBM/CMM utilization in China

### ■ Power Generation

- ❑ By the end of 2008, 1400 CMM generator units with total installed capacity of 920 Mw in China
- ❑ CMM used for power generation will reach more than 3 billion m<sup>3</sup>, and the total installed capacity of generating sets will reach 1500 MW.
- ❑ 120 MW CMM power plant in Jincheng is in operation, the largest CMM power plant in the world, which will consume 180 million m<sup>3</sup> CMM and generate the electricity of 720 million kWh.





## 5. CBM/CMM utilization in China

- Industrial fuel:
  - Shanghai Cimic Tile Com., Ltd. utilizes CMM from Fengcheng Mining Bureau as industrial fuel to produce ceramic tile.



Production line of ceramic tile utilized CMM as industrial fuel

## 5. CBM/CMM utilization in China

### **CMM with methane content under 30%**

- CCII , Sponsored by EPA
- Study on Demonstration Project of Power Generation using Low Quality CMM
- Demonstration site locates in Dingji coal mine of Huainan Mining Group
- 2 generating units with installed capacity of 1000Kw have established, and other 4 generating units will be installed.



**Drainage pump station of low quality CMM in Dingji coal mine**



**Construction Site of Demonstration Project**

## 5. CBM/CMM utilization in China

- Ventilation Air Methane
  - Thermal Oxidation
  - Catalytic Oxidation
  - Auxiliary Fuels for Gas boilers or Gas Engines
  - MEGTEC, demonstration projects in Australia



## 5. CBM/CMM utilization in China

### ■ **CBM/CMM Liquefaction**

#### ■ **CBM Liquefaction**

Concentration of CBM is usually over 95%. After decarburization, desulfurization, demercuration and dehydration of CBM, CBM can directly be turned into LCBM with high pressure and low temperature.

#### ■ **CMM Liquefaction**

If directly pressured and liquefied, CMM with low methane content and oxygen can cause explosion. By cryogenic rectification, separation and liquefaction of CMM can be finished together at low temperature. By this technology, CMM with 35%-50% methane can be purified, liquefied and turned into LNG with 99.8% methane .

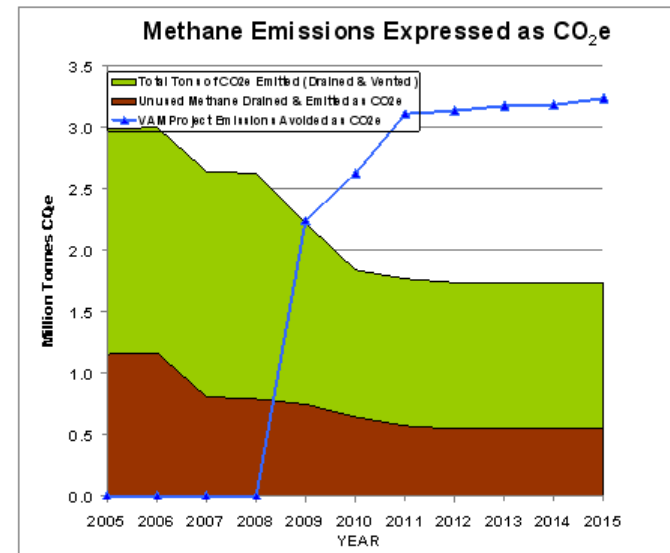
## 6. Potential Opportunities

- CMM Power Generation Project in Fangzhuang No.2 Mine
  - The project is located in Jiaozuo City, Henan Province.
  - Fangzhuang No. 2 Mine produced 330 thousand tonnes of coal in 2009. The project plan to construct a CMM drainage pump station and make use of the CMM for power generation. Four drainage pumps will be installed. The estimated drainage volume is 60 m<sup>3</sup>/min. A 1.5 MW CMM power station will be constructed. The estimated annual emission reductions will be 75,000 tonnes of CO<sub>2</sub> equivalent. The investment of the project is expected to be approximately 10 million RMB.



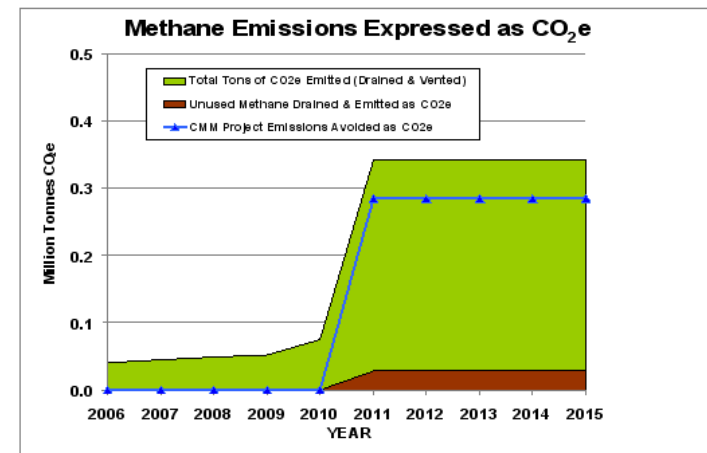
## 6. Potential Opportunities

- VAM Utilization at Xiaodongshan Shaft of Sihe Mine
- The project is located in Jincheng City, Shanxi Province.
- the ventilation flow rate of Xiaodongshan Shaft is approximately 15,000m<sup>3</sup>/min, with the average methane flow rate of 0.53 m<sup>3</sup> per minute. Annually, 40.768 million m<sup>3</sup> of pure methane is directly emitted to the atmosphere. The project plans to install 11 sets of VAM oxidation equipment for direct destruction. The estimated annual emission reduction will be 362,516 tonnes of CO<sub>2</sub> equivalent. The total investment of the project is 88.88 million RMB.



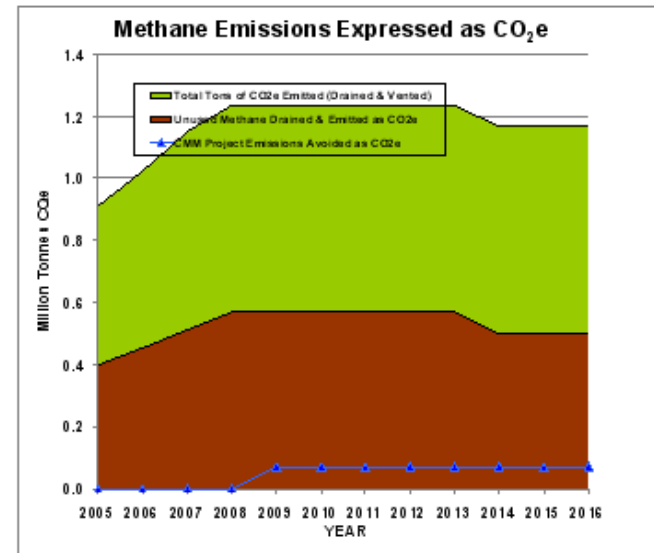
## 6. Potential Opportunities

- **CMM Power Generation Project at Jiulishan Coal Mine**
  - The project is located in Jiaozuo City, Henan Province.
  - The coal production of Jiulishan coal mine in 2009 reached 910 thousand tonnes. In the project, three drainage pumps with a total capacity of 300 m<sup>3</sup> per minute will be installed. The gas drainage volume is 140 m<sup>3</sup> per minute at 30% methane concentration. A 5 MW CMM power station will be constructed. Project investment is expected to be approximately 30 million RMB.



## 6. Potential Opportunities

- Demonstration project of Low-Quality CMM Utilization in No. 1 Mine of Yangquan Coal Industry (Group) Co., Ltd.
  - The project is located in Yangquan City, Shanxi Province.
  - The CMM drainage volume of No.1 mine in 2008 reached 52 million m<sup>3</sup>, with 12 million m<sup>3</sup> utilized, mainly for household use.
  - The demonstration project plans to dilute the CMM drained from the drainage station of No.1 Mine to approximately 2% by mixing with ventilation air methane (VAM), for power generation and methane destruction. The project is expected to reduce 5.5 million m<sup>3</sup> of methane each year. Project investment is estimated at 15 million RMB.





## 6. Potential Opportunities

- **CMM Liquefaction Project at Hezuo Mining Area**
- The project is located in Jiaozuo City, Henan Province.
- A coal mine methane (CMM) surface drilling program will be conducted in 2010, with the expected result of 200 producing wells. Provided that the daily production of each well meets an expected 200 cubic meters (m<sup>3</sup>), annual CMM production will reach 150 million m<sup>3</sup>.
- The project will establish a CMM liquefaction project with annual production of 100,000 tonnes, which will utilize 125 million m<sup>3</sup> CBM and provide emission reductions of 2 million tonnes of CO<sub>2</sub> every year. Project investment costs are estimated at 600 million RMB



**CMM Purification/Liquefaction Pilot Plant**

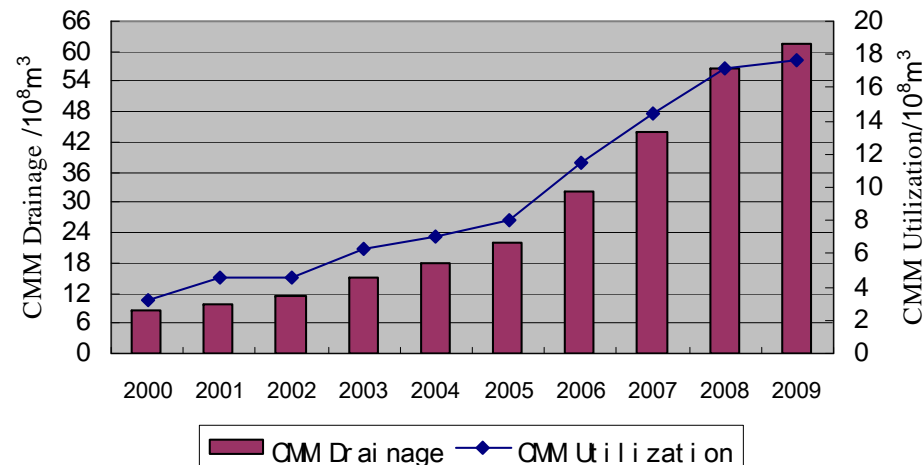
## 7. Preferential Policies for CBM/CMM Recovery and Utilization

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- **Preferential Policies**
  - **1. Policies of Subsidy Investment**
  - **2. Policies of Preferential Price**
  - **3. Policies of Preferential Tax**
  - **4. Policies of Mining Right management**
  - **5. Policies of International cooperation**
  - **6. Policies of Tariff Reduction**

## 7. Preferential Policies for CBM/CMM Recovery and Utilization

- **The effect of preferential Policies**
- 1 .The increase of CMM Recovery and Utilization
- In 2009, the CMM drainage volume has reached 6.17 billion m<sup>3</sup>, increased by 180% compared with 2005 level, and the utilization volume has exceeded 1.77 billion m<sup>3</sup>, up by 121%. During 2005 to 2008, CMM drainage and utilization has achieves a leap in development.

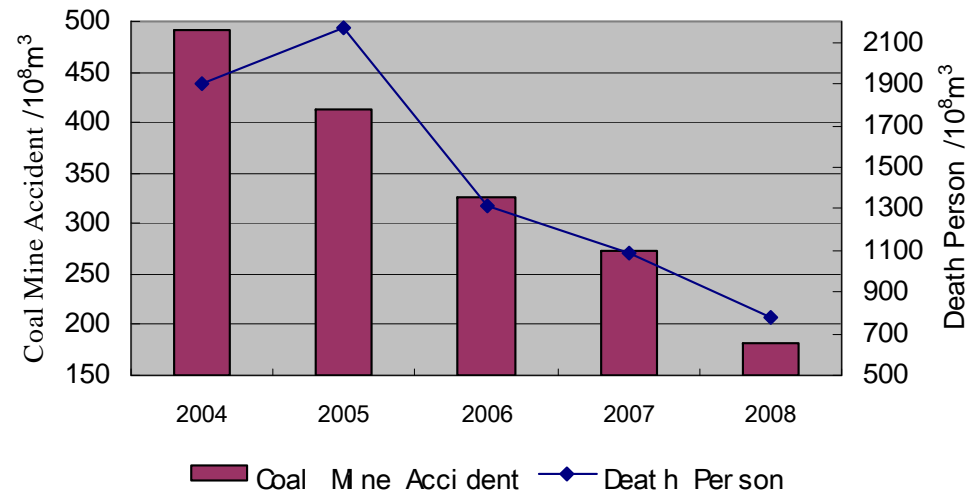


## 7. Preferential Policies for CBM/CMM Recovery and Utilization

### ■ The effect of preferential Policies

#### ■ 2. The increase of coal mine safety

In 2008, 182 gas accidents occurred in coal mines, 232 accidents less than that in 2005, dropped by 56%. 778 persons died in the accidents, 1393 persons less than that in 2005, dropped by 64%. The occupational safety in coal mines has been greatly improved.



## 8. Latest progress of coal mine sector in M2M Partnership

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- Coordination meeting of M2M was held by Department of Climate Change of NDRC.
- Mr. Gao Guangsheng, Director for Department of Climate Change chaired the meeting. The participants from coal mine sector, landfill sector, agriculture sector and oil & gas sector attended the meeting.

## 8. Latest progress of coal mine sector in M2M Partnership

- Office of Methane to Markets Partnership was established, and located in China Coal Information Institute.



## 9. Conclusions

- ( 1 ) Abundant CMM/CBM resources in China; great progress in CBM/CMM development, in particular, underground horizontal drilling and surface wells with bilateral branches drilling technologies.**
- ( 2 ) Rapid development in power generation with fuels of CMM/CBM**
- ( 3 ) Utilization of CMM with low methane concentration and VAM become new is attractive for investment; It is suggest to establish demonstration projects**
- ( 4 ) Working out relevant regulations and preferential policies for development and utilization of CMM with low methane concentration**

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***Thank You!***