Opportunities and Barriers for CMM Development in China

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1. Background

- Largest coal producer and largest emitter of coal mine methane (CMM) in the world
- Increasing demands for energy
- Coal mine safety
- Growing CBM/CMM industry
2. Review of CMM Projects-with support of USEPA

- China National Coal Association
- State Administration of Coal Mine Safety Supervision (SACMS) & State Administration of Work Safety (SAWS)
- Ministry of Science & Technology (MOST)
- China Coal Information Institute (CCII)
  National Institute for Occupational Safety (NIOS)

- National Institute
- Established in 1959
- A Non-governmental Organization with staff of 800
2. Review of CMM Projects-with support of USEPA

The 3rd International Methane & Nitrous Oxide Mitigation Conference, November, 2003, Beijing

#Coal mining #Landfill #Natural gas #Agriculture
2. Review of CMM Projects—with support of USEPA

- The Coalbed Methane Clearinghouse was established at the CCl in 1994, funded by USEPA.
2. Review of CMM Projects-with support of USEPA

- follow-up projects
  - *From October 1, 1999 to December 31, 2001*
    Coal Mine Methane Market Development
  - *From January 1, 2002 to December 31, 2003*
    Commercializing Coal Mine Methane Projects
  - *From April 2004 to April, 2006*
    Ventilation Air Methane/Coal Mine Methane Recovery and Utilization in China

2005-1-21
2. Review of CMM Projects-with support of USEPA

- Preparation of data packages of potential CMM projects in 8 key mining areas
  - Jingcheng, Huainan, Fushun, Jiaozuo
  - Huaibei, Yangquan, Panjiang, Pingdingshan
2. Review of CMM Projects-with support of USEPA

- Country Study with USDOE and EPA
  - GHG Mitigation Technology Assessment and Development Strategies—CBM/CMM
2. Review of Projects- with other partners

- Asian Development Bank Projects
  - Improvement of Environment in Liaoning with total investment of US$250 million including three components
    - Central heating
    - CBM/CMM development
    - Gas pipeline network
2. Review of Projects- with other partners

- The Feasibility Study of Coal Mine Methane Demonstration Project in Yangquan
- Feasibility study on CMM power plant with total capacity of 120MW at Jincheng Coal Mines
2. Review of Projects- with other partners

- UNDP Project— Coalbed Methane Resources Development in China
  - With the grant of US$10,000,000
  - Four sub-projects
    - Evaluation of Coalbed methane Resources
    - demonstration projects in Songzao, Kailuan and Tiefa
2. Review of Projects- with other partners

- UNDP Projects for 2004-2005: Building Capability of CDM implementation in China
  - Coal Mine Methane
  - Renewable Energy
  - Energy Efficiency
3. Opportunities for CMM Development in China

3.1 Coalbed Methane Resources and Emissions

- The coalbed methane resources reach 3.0-3.5 trillion m$^3$. 
3. Opportunities for CMM Development in China

CBM Resource Distribution in Region

- Northeast: 7.6% (2.4)
- North China: 61.7% (20.1)
- Northwest: 15.5% (5.1)
- South: 15.2% (5.0)

Total: 32.6 TCM
3. Opportunities for CMM Development in China

- CMM emissions increased from 6.35 billion m$^3$ in 1987 to about 10 billion m$^3$ in 2000, accounting for 1/3 of global emissions (EPA-19.1 billion m$^3$)
3. Opportunities for CMM Development in China

3.2 Status of Coalbed Methane Recovery and Utilization

- Underground Drainage
  - CMM Recovery Over the Last 10 Years
  - 1.5 billion m³ estimated in 2004

![Graph showing underground drainage amount from 1990 to 2002]
### 3. Opportunities for CMM Development in China

The top ten coal mining areas with methane drainage ($10^6$m$^3$)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>阳泉(Yangquan)</td>
<td>85.8</td>
<td>89.5</td>
<td>76.9</td>
<td>90.5</td>
<td>92.7</td>
<td>101.0</td>
<td>115</td>
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<td>抚顺(Fushun)</td>
<td>99.9</td>
<td>102</td>
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<td>113</td>
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<td>4.06</td>
<td>4.2</td>
<td>5.0</td>
<td>6.6</td>
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<td>松藻(Songzao)</td>
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<td>铁法(Tiefa)</td>
<td>25.2</td>
<td>18</td>
<td>10.2</td>
<td>16.3</td>
<td>22.1</td>
<td>23.5</td>
<td>36</td>
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<td>水城(Shuicheng)</td>
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<td>19.5</td>
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<td>宁煤(Ningxai)</td>
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<td>淮北(Huaibei)</td>
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<td>芙蓉(Furong)</td>
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<td>27.1</td>
<td>28.9</td>
<td>24.7</td>
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3. Opportunities for CMM Development in China

The Schematic Diagram of Drainage Methods

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3. Opportunities for CMM Development in China-application of US technology in China
3. Opportunities for CMM Development in China

Surface development

- surface well drilling technology introduced early 1990s
- Gas flow from a single well-16000 m³ per day
- At stage of exploration development.
### 3. Opportunities for CMM Development in China

**CBM Projects with foreign investors in China**

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Name</th>
<th>Location</th>
<th>Area (km²)</th>
<th>Contractor</th>
<th>Term</th>
<th>Signing Date</th>
<th>The Number of Drilled Wells</th>
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<td>BP</td>
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<td>BP</td>
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<td>Shanxi</td>
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<td>Shanxi</td>
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<td>Hengshanpu</td>
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<td>1708</td>
<td>Virgin</td>
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</tr>
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</table>

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3. Opportunities for CMM Development in China

Ventilation Air Methane (VAM)

- More than 10 billion m$^3$ Methane (mine gas) released from China coal mines per year
- VAM accounts for 91%.
3. Opportunities for CMM Development in China

3.3 Coalbed Methane Utilization

- Town gas & Fuel
- Power Generation
- Chemical Products
- Gas-fueled Vehicles
3. Opportunities for CMM Development in China

- CMM as Town Gas & Fuel
  - Supplying CMM from Fushun coal mines to Shenyang City in Liaoning Province
  
  - CMM used as fuel for local alumina plant in Yangquan
  
  - CMM used as fuel for ceramics plant in Tiefsa
3. Opportunities for CMM Development in China

- CMM for Power Generation

- Jincheng 120MW CMM Power Generation
  - Methane abatement: 169 Mm3/a
  - TDA Project: with the grand of US$500,000
  - ADB’s support
3. Opportunities for CMM Development in China

- Small size power plants with domestic equipments. >70MW totally

<table>
<thead>
<tr>
<th>Coal Mines</th>
<th>Capacity</th>
<th>Factory</th>
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<tbody>
<tr>
<td>Shanxi</td>
<td>6× 2000kW</td>
<td>Nanhang</td>
</tr>
<tr>
<td>Local Mines in Shanxi Provice</td>
<td>32× 500kW</td>
<td>Shengli</td>
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<tr>
<td></td>
<td>3× 400kW</td>
<td></td>
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<tr>
<td>Guizhou</td>
<td>25× 500kW</td>
<td>Shengli</td>
</tr>
<tr>
<td>Liaoning</td>
<td>14× 500kW</td>
<td>Shengli</td>
</tr>
<tr>
<td></td>
<td>1× 1200kW</td>
<td></td>
</tr>
<tr>
<td>Anhui</td>
<td>9× 1200kW</td>
<td>Shengli</td>
</tr>
<tr>
<td>Chongqing</td>
<td>8× 500kW</td>
<td>Shengli</td>
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<tr>
<td>Gansu</td>
<td>2× 2000kW</td>
<td>Nanhang</td>
</tr>
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<td>Henan</td>
<td>2× 500kW</td>
<td>Shengli</td>
</tr>
<tr>
<td>Hebei</td>
<td>1× 2000kW</td>
<td>Nanhang</td>
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</tbody>
</table>
3. Opportunities for CMM Development in China

Potential projects in selected Coal Mines:
- Fushun
- Yangquan
- Jincheng
- Huainan
- Huaibei
- Panjian
- Jiaozuo
- Pingdingshan
4. Successful Experiences

- Huge emissions and resources available for use
- Existing recovery facilities
- Successful pilot project
- Encouraging policy from the government
  - Preferential tax policy
  - Funding from the government
- Great Potential Market
- Recognition, and organizations
5. Obstacles for Methane to Market

- **Underground Recovery**
  - Conflict with coal mining operations
  - Horizontal directional drilling

- **Surface well drilling**
  - Initial stage-needs for technology for reservoir engineering, drilling and gas production
  - CMM utilization projects
5. Obstacles for Methane to Market

- Small size
- Methane supplies: unstable
- Power generation: size, cost
- Pipeline System
- Investment and encouraging policy
6. Capacity and Target

- Preparing Inventory of CMM in Coal Mine Sector
- Developing cost-effective Technology for Methane Recovery
- Removing Barriers
- Technology and economic Policies
- Project Planning, working together with USEPA
Thank You!
4th International CBM/CMM Forum in China

- 1-2 December 2004
- Kunlun Hotel, Beijing
- Co-sponsors:
  - SWAS, CNCA
  - USEPA, ADB