Coal Mine Methane Projects and Opportunities in India

Presented by
SANJAY DUBE
Senior Program Manager

ICF INTERNATIONAL
March 2, 2010
Outline

■ CMM project essentials
  • CMM project benefits
  • Essentials for viability of CMM projects
  • Worldwide progress in CMM development
  • Policies and schemes implemented by countries for CMM development

■ India’s current position in CMM industry
  • Overview of Indian coal sector
  • Significant opportunities, but no recovery efforts
  • Key reasons for slow pace of CMM utilization

■ Harnessing CMM potential in India
  • Thrust areas to make headway in CMM development
  • Initial captive use demonstration could trigger CMM Industry
  • Likely Evolution of CMM industry in India
  • Opportunities galore for global players
  • ICF’s services in CMM project development
Outline

■ **CMM project essentials**
  - CMM project benefits
  - Essentials for viability of CMM projects
  - Worldwide progress in CMM development
  - Policies and schemes implemented by countries for CMM development

■ **India’s current position in CMM industry**
  - Overview of Indian coal sector
  - Significant opportunities, but no recovery efforts
  - Key reasons for slow pace of CMM utilization

■ **Harnessing CMM potential in India**
  - Thrust areas to make headway in CMM development
  - Initial captive use demonstration could trigger CMM Industry
  - Likely Evolution of CMM industry in India
  - Opportunities galore for global players
  - ICF’s services in CMM project development
Numerous benefits make CMM projects hard to overlook

- Increasing energy demand exerting pressure on conventional fuels
- Depleting fossil fuel reserves – CMM is additional source of energy
- Recovery of CMM leads to cost savings and improved mine safety
- Reduction in GHG emissions – Methane having 23 GWP
- Act as distributed generation source, requires less infrastructure
Identifying Potential Sites

Selecting Appropriate Technology

Managing Capital & Resources

Adequate Infrastructure readiness

Favorable Policies

Pricing end-use product

Increasing Project Feasibility Reducing Risks

Essentials for viability of CMM project
Worldwide progress in CMM development is encouraging

- More than 150 projects operating worldwide; around 30 in development phase
- 13 countries have CMM recovery at active/abandoned mines
- More than 3.5 billion cubic meters of methane emission avoided per year

Number of CMM utilization projects (Source: M2M database)
Policies and schemes implemented by countries have bolstered CMM development

- Australia is forerunner in implementing market based incentives
- Germany provides Feed-in-Tariff for CMM same as renewable

<table>
<thead>
<tr>
<th>Drivers of CMM Development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australia</strong></td>
</tr>
<tr>
<td>Kyoto Obligation</td>
</tr>
<tr>
<td>NSW GGAS Scheme</td>
</tr>
<tr>
<td>QLD Gas Scheme</td>
</tr>
<tr>
<td>New Technology</td>
</tr>
<tr>
<td>Funding to CMM</td>
</tr>
</tbody>
</table>
Outline

- **CMM project essentials**
  - CMM project benefits
  - Essentials for viability of CMM projects
  - Worldwide progress in CMM development
  - Policies and schemes implemented by countries for CMM development

- **India’s current position in CMM industry**
  - Overview of Indian coal sector
  - Significant opportunities, but no recovery efforts
  - Key reasons for slow pace of CMM utilization

- **Harnessing CMM potential in India**
  - Thrust areas to make headway in CMM development
  - Initial captive use demonstration could trigger CMM Industry
  - Likely Evolution of CMM industry in India
  - Opportunities galore for global players
  - ICF’s services in CMM project development
Coal will continue as major energy source for India

- India is 3rd largest producer of coal today
- 56% of primary energy comes from coal as against 29% globally
- 60% power generation from coal against 40% globally
- IEP* projects decline of coal in energy mix from 54% to 41% by 2031-32 if India makes maximum efforts to move towards cleaner energy mix

Projected Fuel mix in 2031-32*

<table>
<thead>
<tr>
<th>Category of mines</th>
<th>Gassiness (m3 of gas per tonne coal mined)</th>
<th>No of mines</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-I mine</td>
<td>&lt;1 m3</td>
<td>222</td>
</tr>
<tr>
<td>D-II mine</td>
<td>&gt;1 to 10 m3</td>
<td>102</td>
</tr>
<tr>
<td>D-III mine</td>
<td>&gt;10 m3</td>
<td>18</td>
</tr>
</tbody>
</table>
Despite tremendous opportunity, no recovery efforts so far

Source: US EPA 2008

India is lagging in CMM recovery and use Project
Reasons for slow pace in CMM utilization in India

- Majority of mining (85%) is done open cast
- Mining using old technology; Focus till date is only on ventilation
- Lack of policy to curb methane release – Current guidelines apply to methane concentration not on volume released
- Lack of proven technology for use of low quality gas and VAM
- Lack of market based scheme to incentivize investments
- CMM resource estimation has not been done
- No mechanism to compensate investment in case project fails
Outline

- **CMM project essentials**
  - CMM project benefits
  - Essentials for viability of CMM projects
  - Worldwide progress in CMM development
  - Policies and schemes implemented by countries for CMM development

- **India’s current position in CMM industry**
  - Overview of Indian coal sector
  - Significant opportunities, but no recovery efforts
  - Key reasons for slow pace of CMM utilization

- **Harnessing CMM potential in India**
  - Thrust areas to make headway in CMM development
  - Initial captive use demonstration could trigger CMM Industry
  - Likely Evolution of CMM industry in India
  - Opportunities galore for global players
  - ICF’s services in CMM project development
Thrust areas to make headway in CMM development

### Positives so far

- Establishment of CBM clearing house
- Well laid CBM policy
- Imported coal, gas and LNG prices make Coal based gas attractive
- GAIL is building gas pipeline between North and East which will pass through coal regions

### Suggested ways to go forward

#### Technology
- Adapting technology to smaller scale and to suit Indian conditions

#### Policy
- Policy to curb methane volume release
- Mandatory policy for pre-mining degasification
- Transparent dissemination of information for evaluating commercial viability
- Expediting private participation
- Market creation for clean energy technology

#### Finance
- Reliable cost recovery mechanism
- Channalize finance through international co-operation
- Financing using Govt. subsidies/incentives
CMM projects by coal owners for captive purpose can be implemented with minimal fuss

- Implementing pilot level demonstration projects
- Less infrastructure required for local consumption
- Capable to finance such projects
- No legal issues related to ownership of gas
Changing mining trend and pursuing clean technology will trigger evolution of CMM industry in India

- Auction of CBM blocks
- Pilot CBM project at Munidih (BCCL) funded by GEF, UNDP
- Commercial CBM production by GEECL from Raniganj block
- CMM Feasibility study in some mines
- More CBM wells will start producing
- Use of CMM for captive use and in local area
- Development of Pipeline infrastructure
- Flow of CBM/ CMM to demand centre
Once proven, India becomes a very large market for global players

- Demonstration of technology adaptation through pilot projects
- Training to operate technology and capacity building
- Knowledge transfer of best practices through training/workshop/tours
- Direct investment in recovery and end use projects
- Indirect investment in customization of technology and various services
ICF can help in achieving your goal

- Feasibility study for CMM project development
- Conducting end use analysis study for CMM
- Regional demand – supply market analysis
- Governmental policy and regulatory impact analysis
- Designing enterprise’s climate change and sustainability policy
- Evaluating financial benefits under the emerging global emission trading schemes
For more Information

Sanjay Dube

sdube@icfi.com

ICF International
2nd Floor, Thapar House,
124 Janpath, New Delhi 110 001
India
+91.4354 3027