COAL MINE METHANE PROJECT OPPORTUNITY
Asnapani-Jarangdih CMM Project
Central Coalfields Ltd
East Bokaro Coalfield, Jharkhand, India

OVERVIEW OF COAL MINE METHANE PROJECT:
The Asnapani-Jarangdih CMM block is located in the central part of East Bokaro Coalfield near the Bokaro Steel City township in Jharkhand, India. The CMM block covers an area of 4 km² and has an estimated coal resource of 620 MT. The gas resource is estimated to be 6.2 BCM (219 Bcf). There are 22 coal seams (Seam Karo-I to Jarangdih Top) in the area. Jarangdih U/G mines are actively mining the upper Jarangdih group by bord and pillar method. The virgin seams, Sawang 'C' through Karo-VI, are the target seams for CMM recovery. The coal rank ranges from low to medium volatile bituminous and has an average gas content of over 10m³/t (353 scf/ton). A commercial CBM project operated by ONGC near Asnapani-Jarangdih is in pilot phase and has shown encouraging CBM prospects. Data dossiers encompassing all details related to geology, mining history, and gassiness has been prepared.

ESTIMATED ANNUAL EMISSION REDUCTIONS: 0.881 MMTCO₂E

PROJECT DETAILS
• Name of Project: Asnapani-Jarangdih CMM Project
• Name of Mine: Jarangdih U/G Mine
• Type of Ownership: Public Sector Undertaking
• Target coal seams: Virgin seams lying below the mined out coal seams
• Type of assessments performed: A detailed data dossier is under preparation, which will form part of bid document

MINE INFORMATION
• Mine owner: Central Coalfields Ltd
• Parent company: Coal India Ltd
• Status of mine: Active
• Type of mine: Underground
• Mining Method: Bord & Pillar

PROJECT FINANCES
• Assumptions: $5-$7/Mcf
• Estimated revenue: $22-27 Million
• Projected capital costs: Approximately $16 Million
HISTORICAL AND PROJECTED MINE DATA

HISTORICAL COAL PRODUCTION

<table>
<thead>
<tr>
<th>YEAR</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
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</thead>
<tbody>
<tr>
<td>Coal (tonnes/yr)</td>
<td>135,000</td>
<td>170,000</td>
<td>200,000</td>
<td>200,000</td>
<td>125,000</td>
<td>114,000</td>
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<tr>
<td>Methane (Mm³/yr)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Emitted from ventilation system(s)</td>
<td>0.617</td>
<td>0.777</td>
<td>0.914</td>
<td>1.060</td>
<td>0.571</td>
<td>0.521</td>
</tr>
<tr>
<td>Liberated from drainage systems</td>
<td>5.0</td>
<td>15.0</td>
<td>30.0</td>
<td>45.0</td>
<td>55.0</td>
<td>62.0</td>
</tr>
<tr>
<td>Vented to atmosphere</td>
<td>0.617</td>
<td>0.777</td>
<td>0.914</td>
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PROJECTED COAL PRODUCTION AND METHANE EMISSIONS

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<td>Coal (tonnes/yr)</td>
<td>125,000</td>
<td>150,000</td>
<td>175,000</td>
<td>200,000</td>
<td>200,000</td>
<td>225,000</td>
<td>250,000</td>
<td>250,000</td>
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<td>Methane (Mm³/yr)</td>
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<td></td>
<td></td>
</tr>
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<td>0.685</td>
<td>0.799</td>
<td>0.914</td>
<td>0.914</td>
<td>1.028</td>
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*2011-2019 Annual coal production estimated based historic data

GREENHOUSE GAS EMISSION REDUCTIONS

At present there is no system of methane drainage and therefore, there is no utilization of CMM from the project area. There is no existing gas drainage system operational in the operating mine. To reduce the release of methane into the environment from the operating mine and to make future mining safe, this CMM project has been perceived.

TOTAL VOLUME OF METHANE EXPECTED TO BE RECOVERED/UTILIZED

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<tr>
<td>Total CH₄ recovered and utilized (m³/year)</td>
<td>5.0</td>
<td>15.0</td>
<td>30.0</td>
<td>45.0</td>
<td>55.0</td>
<td>62.0</td>
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COAL PRODUCTION AND METHANE EMISSION CHARTS
MARKET ANALYSIS / DEMAND ANALYSIS

The CMM produced after implementation of the Asnapani-Jarangdih CMM Project would have a ready market as it is located close to the developed industrial area of Bokaro Steel City and Dhanbad. The produced CMM may be utilized in the Bokaro Steel Plant or other steel plants, or in other industries.

TYPE OF ASSISTANCE SOUGHT

Technical Assistance:
- CBM resource assessment in de-stressed coal seams
- Techno-economic evaluations of the project
- Adoption of suitable drilling technology

PROPOSED TECHNOLOGIES

To be adopted after careful examination of existing geo-mining conditions.

For More Information, Contact:

GM, CBM, CMPDI,
Gondwana Place, Kanke Road
Ranchi- 834008, Jharkhand, India
Tel: +91 651 2230011, Fax: +91 651 2233314
E-mail: gmcbm@cmpdi.co.in, bnprasad54@yahoo.co.in

Central Coalfields Ltd,
Darbhanga House, Ranchi-834 001,
Jharkhand, India
Tel: +91 651 2301606, 2316707, Fax: +91 651 2315257/2204479

Disclaimer: The information and predictions contained within this poster are based on the data provided by the site owners and operators. The Global Methane Initiative cannot take responsibility for the accuracy of this data.