Indigenous resources and potential

The coal-bearing formations of India occur in two distinct geological horizons in the Lower Gondwana (Permian) belts of India and the Tertiary sediments (Eocene-Oligocene) of north-eastern India, Rajasthan, Gujarat, and Jammu and Kashmir. Methane gas is entrapped within these formations at a wide range of sub-surface depths.

The knowledge of methane occurring with coal beds is as old as the mining itself. However, initially it was treated more as a hazard than a resource. Being highly explosive, coal mines have faced many explosions in the past due to this gas. In China, such explosions are a common occurrence due to lack of proper ventilation in mines. High capacity fans are used to dilute the gas during mining and the mixture is released into the atmosphere. Thus, the resource is not only lost, being a greenhouse gas, it contributes to the global warming. Coal mining is reported to be contributing about nine per cent of the total methane emissions. The total methane emission is 270–449 teragrams (Pande S K. 1996).

In the past, methane had oozed out of the boreholes on several occasions during exploration of coal. Many of the mines in Jharia, Ranigunj, Karanpura, and Bokaro coalfields have been found gassy. The Director General of Mines Safety has categorized these mines based on the quantum of methane given off during the process of mining. A large number of our mines are estimated to produce less than 1 m$^3$/tonne of coal produced and are defined as Degree I mines; some of them are Degree II mines giving off 1–10 m$^3$/tonne of output. Only 21 underground mines in Damodar Valley in Jharia, Ranigunj, and Bokaro coalfields are listed as Degree III mines, where the rate of emission exceeds 10 m$^3$/tonne of coal output. A few mines also belong to tertiary deposits in Assam. However, such indicative information is highly inadequate to estimate the potential of CBM (coal-bed methane). The estimation of availability of CBM is a complex, time-consuming, and capital-intensive process. For example, the number of drill holes needed for exploring CBM is 10 times that needed for natural gas. The time and cost involved in pumping out the associated water from CBM drill holes are also high. The quantum of gas is dependent on many parameters and some of them are highly variable.

In the last decade, after the realization that methane from coal bed can be gainfully utilized, many agencies and research organizations such as the Central Fuel Research Institute, the Central Mining Research Institute, the Central Mine Planning and Design Institute, the Oil and Natural Gas Corporation, and the Mineral Exploration Corporation have become interested in CBM and are generating useful data. Many private agencies like the Amoco and Reliance also have contributed in this regard. In spite of all this, the data on the estimates are highly varied and the CBM potential of India can at best be summarized as below (Table 1).

Table 1 Coal-bed methane resources in India (estimated by various authors) (billion cubic metres)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Gondwana basin</th>
<th>Tertiary</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bastia et al. (1995)</td>
<td>837</td>
<td>13</td>
<td>850</td>
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Investigation on CBM for its commercial exploitation is a comparatively recent phenomenon in India. It was mooted by the Ministry of Coal, Government of India, way back in 1994 when several companies from India and abroad showed keen interest in the subject. The notable ones were Reliance Gas (P) Ltd, Modi Mcenzee, and Amoco, etc. However, though the blocks were allotted to some of them by the Ministry of Coal, it was discovered that the resource came under the preview of the MoPNG (Ministry of Petroleum and Natural Gas). The administrative and bureaucratic wrangle between ministries resulted in a long delay and some of the companies lost interest due to working uncertainty and legal barriers. Finally, the MoPNG was entrusted with the responsibility of framing the policy for the development and use of CBM in India.

In the period 1997–2000, the ONGC drilled some test holes and found substantial amount of gas in Bihar in the Parbatpur block. The boreholes were capped after flaring of the gas for some time and search started for the technology for its exploitation and customer for its utilization.

In the mean time, the United Nations Development Programme gave a grant of $9.19 million to the Ministry of Coal for the investigation of CBM in Bihar–Bengal coalfields. The Ministry of Coal has since started the work in several mines and adjoining areas. The total project cost is estimated at $19.226 million. The project duration is 5 years and is likely to be completed in 2005. This project is likely to generate useful data on CBM and, after successful completion, is likely to generate more confidence in the prospective investors.

After it was decided that the CBM subject will be dealt by the petroleum ministry, a CBM exploitation project was formulated by the Director General of Hydrocarbons with the help of the MoPNG. The project envisaged four phases: Phase I - Exploration, Phase II - Pilot Assessment and Market Confirmation, Phase III - Development, and Phase IV - Production. In the immediate context, only Phase I was to be considered and, to start with, the shallow depth coal-beds of the Lower Gondwanas of the eastern and central parts of India was to be offered. The extent of these beds was of the order of 11,000 km², made up of:

- 2800 km² in the Raniganj, Jharia, East Bokaro and West Bokaro coalfields in the Damodar Valley belt (Jharkhand), and
- 8200 km² in the Sohagpur and Satpura coalfields of Central India (Madhya Pradesh).

Within these areas, it was proposed to outline 10 blocks, varying in size from 200 to 500 km², in consultation with the Ministry of Coal and offer them for international competitive bidding. Offers included several fiscal and other incentives for the bidder. However, it took quite some time to do the
Finally, the petroleum ministry recently held the first road show in Delhi, promising expeditious finalization of bids and a time-bound commencement of exploration activities for CBM. This was followed by two road shows in the US. The road shows, it is reported, were attended by a large number of representatives from the public sector and some private sector investors.

The bid has been floated offering 7 blocks (out of the 10 suggested earlier) for exploration of CBM. The total area of these blocks is 2430 km² for 6 blocks of Gondwana and 410 km² of Tertiary lignite with a total estimated CBM resource of above 280 billion cubic metres. These blocks have an estimated reserve of high grade, high-to-medium volatile bituminous/sub-bituminous coal to the extent of 40.58 billion tonnes and 4.8 billion tonnes of lignite. The depth of burial ranges from 100 to 1500 metres for coal and 100 to 400 metres for lignite. The gassiness is estimated to be a minimum of 4 m³/tonne and the maximum varies up to 15 m³/tonne.

The main laws governing CBM exploration and production in India are listed below.

- Oilfields (Regulation and Development) Act, 1948
- Petroleum and Natural Gas Rules, 1959
- Environment Protection Act, 1986
- Arbitration and Conciliation Act, 1996
- Income Tax Act, 1961
- Customs Act, 1962.

The exploration of CBM, as mentioned earlier, is time-consuming and capital-intensive. Unless fiscal and other incentives are in place, the possibility of investors getting interested is remote. Keeping this in mind, many fiscal incentives have been offered in the bid as listed below.

- No signature bonus
- No upfront payments
- No import duties
- Unincorporated joint ventures permitted
- No limitation on cost recovery
- Free to market gas in the domestic market at market-determined prices
- Securitization of participating interests allowed for raising project finance
- No bank guarantee required for work programme at development stage
- 7-year tax holiday
- Liberal set-off and accelerated deductions for income-tax purposes
- No ring fencing.

The last date for receipt of the bids is 31 August 2001. It is an international competitive bidding where 100% foreign participation has been allowed. The weightages for the main parameters to be used for bid evaluation (under New Exploration Licensing Policy-II) will be based on technical capability (20%), financial strength (10%), work programme (50%), and fiscal package (20%).

With the necessary homework done in advance and with transparent procedure being followed by the ministry, it is hoped that the exploration of CBM and later its exploitation and use will become a reality soon. It may not get the status of a major source of energy but surely will supplement the available fuels for power generation and other uses. Its possible recovery is now being recognized as a viable option to enhance the natural gas potential of the country.

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