



Coal Mining and CBM exploitation- Challenges and Opportunities In Indian Context

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Historical Perspective

- Journey of CBM development started way back in **1992** when M/S AMOCO approached CMPDI for an assessment of CBM potentiality in India.
- Three blocks were allotted to different operator by FIPB. Due to non clarity in Licensing regime, operator could not proceed much
- In 1997, GoI formulated a CBM policy wherein CBM has been considered as **Natural Gas** and accordingly MoP&NG was designated as Administrative Ministry for the subject.
- CBM blocks were to be carved out in consultation with MoC and to be developed through **Global Competitive bidding** under the aegis of DGH. Some fiscal incentives were given. First round bidding in 2001.
- For proper co-ordination between MoC and MoP&NG in this regard a **Joint Committee** is being put in place and an **MoU** has been signed
- Concurrent exploitation of CBM and coal was also looked into and interministerial delegation recommended for such development



Background

- Till date, 33 CBM/LBM block awarded among which, 17 relinquished/terminated, 8 under exploration/appraisal, 7 under development & 1 under commercial development.
- After 18years, total commercial production is around 1 MMSCMD from 1 block. On full scale development of 8 blocks, production may reach around 6 MMSCMD by 2017.
- In the meanwhile due to ever changing coal demand and changing techno economic perspective towards coal mining, many coal block got awarded which overlaps with CBM blocks and the issue of concurrent exploitation cropped up
- DGMS opines that it is always preferable if same operator is assigned for both coal mining and CBM exploitation if concurrent activity is to be undertaken.
- After clearance by Cabinet in 2013 and CoS on July' 2015, Coal India got right to exploit CBM from its mining leasehold area.



International Scenario

- Internationally, methane is being exploited prior to mining as somehow similar to degasification effort primarily through in seam wells.
- The major players are USA, China and Australia.
- In all these countries, **structural complexity in coal is much lesser than India.**
- In this field, China is presently producing about 12.5 BCM methane annually (34 MMSMD).



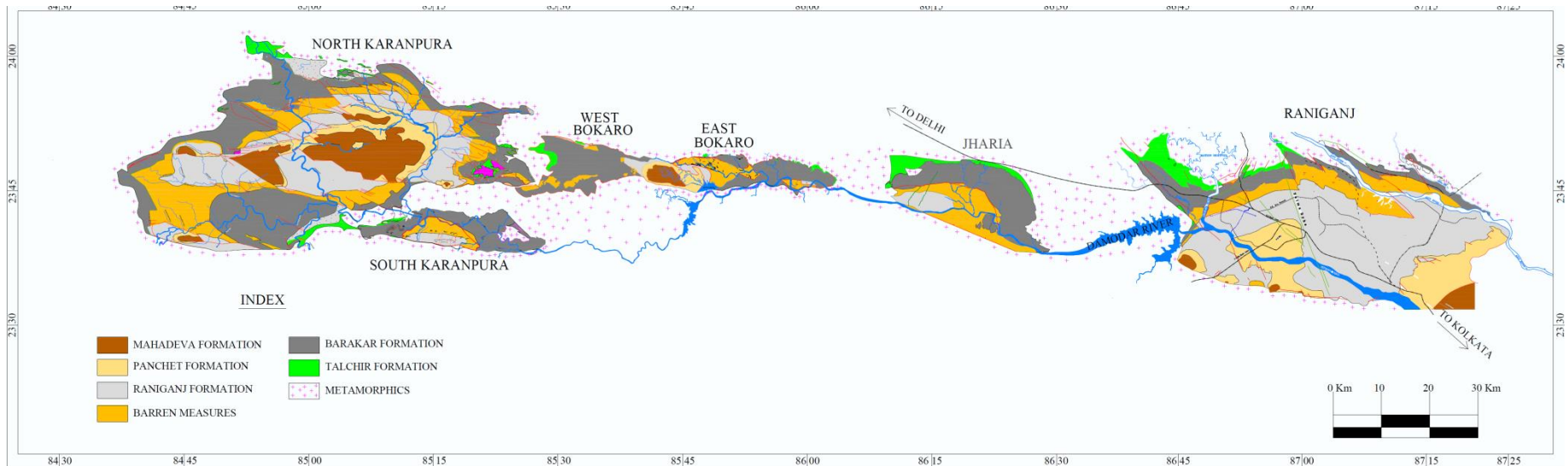
Indian Context - Journey so far

- Following observation from our journey in CBM development will guide in targeting areas for possible CBM development from coal mining leasehold
 - Good Gas content and producibility of CBM is restricted to mainly **Damodar valley coalfields** and to some extent Sohagpur coalfield.
 - May be due to structural complexity and non understanding of microstructure in coal due to tectonic regime, **horizontal multilateral well drilling could not yield desired results** and remains technological challenge in Indian context and thus CBM has to be harnessed through conventional vertical/inclined wells only.
 - CBM specific data from non Damodar valley coalfields generated under PRE funding is of **marginal significance**.



Indian Context - Target Area

- Thus, the present focus on CBM development from Coal mining area is from Damodar Valley coalfield of Raniganj, Jharia, E&W Bokaro, North & South karanpura and Ramgarh coalfield.





CBM resource in CIL area- Damodar Valley Coalfields

	Coal Resource (in Mte)	Coal resource in CBM block (in Mte) Within 1200 mts	Coal resource outside CBM block (in Mte)
Raniganj Coalfield/ ONGC-CIL_Sec A	26668	4241	14202
Raniganj Coalfield/ ONGC-CIL_Sec B		4700	
Raniganj Coalfield/ GEECL		3525	
Jharia coalfield	19430	11491	7939
Bokaro Coalfield	13254	7500	5754
North Karanpura coalfield	18279	15230	3049
South karanpura coalfield	6578	5020	1558
Ramgarh Coalfield	1556	0	1556
Total			34058



CBM resource in prospective CIL area

- Above Coal resources are primarily within the depth of 600mts and around 70% of these are in command area of Coal India
- Thus available coal resource which is under CIL command area is 23840 Mte.
- At present around 15% of such resource has already got exhausted for all practical purpose through open cast mining or underground (developed/depillared) mining.
- Thus CBM may be exploited from around 20264 Mte or say 20 Bte (i.e. **7% of coal inventory**) of coal under Coal India Limited.
- Tentatively such Coal resource may hold a CBM resource of around **162 BCM**.



Indian Context - Understanding Technological Challenges

- In last 20 years, CIL/CMPDI could develop understanding of various aspects of CBM/CMM development based on its following association
 - ✓ Preparation of data dossier for virgin CBM for DGH
 - ✓ Study of gassiness in the mines,
 - ✓ Understanding of effect of stress due to mining on CBM play,
 - ✓ Generation of CBM related data from promotional drilling,
 - ✓ Completion of demonstration project on recovery and utilization of CBM from mining area and
 - ✓ Lastly from its association in commercial CBM activity with ONGC as consortium partner.

- Based on all these association, certain understanding emerged as **pre-requisite consideration for CMM development**



Indian Context - Technological Understanding

- CMM exploitation from any single average size coal mine would not be economically viable.
- Mining history and Mining perspective has to be fully known before planning CBM drilling in staged and staggered manner.
- Structural complexity of coal seams restrict “in seam drilling” and even if drilled, hydrogeological regime is unpredictable. As a result reservoir de-prssurisation and CBM liberation from coal matrix become uncertain.
- Availability of precise survey plan at detail scale for each of the mined out seam and its precise co-relation.
- Challenges of drilling through standing on pillars for exploiting CBM from virgin seam below working (developed) seam.



Indian Context - Technological Challenges

- Drilling with utmost precision and minimum or no deviation with effective mid course correction so that cased well can pass through successive pillars to reach virgin seam below for exploitation of CBM



- Combined working plan of Putki Bulliary working seam in Jharia CF
- Understanding of serious safety concern of coal mining, because of existence of water logged old workings and depillared area adjacent to operational mines involving human lives



Indian Context - Techno-commercial understanding

- Understanding of would be CBM play under stress released strata condition
- Coal mining stage plans (would be or under operation) and Plan for CBM commercial drilling need to be super imposed and optimum strategy for quick exploitation of CBM has to be drawn.
- Socio-economic and land acquisition strategy need to be known and related risk matrix has to be fully understood.
- Life of CBM well may have to be kept shortened based on close watch on advancement of mines face.
- Certain degree of flexibility based on comparable economics (between harnessing end life CBM vis-a vis coal mining) has to be kept in the operational strategy.



Indian Context - Way Forward

- The technological challenges listed above could be largely overcome in view of very close grid **exploration data confidence** as well as mine data.
- Such data will facilitate Coal India to draw **predictive model for precise drilling and safe operation.**
- Being single operator, prioritization will be easy.
- **Mid course correction** for synchronisation between coal mining and CBM operation would be possible.



Indian Context - Administrative Challenge

- In future Coal India is going to produce larger share of coal through underground mines where safety would be major concern.
- Production of CBM will be just **incidental activity** of coal mining to implement better safety measure and may be a marginal commercial proposition.
- Under the circumstances, at operational level coal mining activities presently are being subjected to various inspections and reporting etc under relevant statute.
- Subjecting **incidental gas exploitation under another set of statute** (if lease has to be acquired under P&NG Rule) will hindered coal India's primary focus of coal mining at field level.



CBM production by CIL Contemplated Action

- Coal mining stage plans and Plan for CBM commercial drilling, need **to be super imposed for strategic planning** so that first lot of wells be placed in the area beyond 8 to 10th years of mining operations.
- CBM/CMM drilling to be ideally spread over a long time horizon to maintain consistent supply as CBM wells optimum production are **short lived** (8/9 years).
- Understanding of would be CBM play under stress released strata condition



CBM production by CIL Contemplated Action

- Coal India has initiated action for exploitation of CBM from some of mining leasehold areas of Eastern Coalfield Limited.
- Presently, out of a total area of 1550 sq km of known limit of Raniganj coalfield, around 650 sq km is under ECL leasehold. 560 sq km is under GEECL and CIL-ONGC CBM blocks.
- For CBM development, initial exercise has brought in certain fact and figures based upon which Project Report for CBM exploitation will be drawn



Outcome of Preliminary Exercise

- 8/10 mining blocks has been combined to make a contiguous block of around 90/100 sq.km.
- Within the leasehold, around 15 percentage area is left where complete column of seams are still virgin and first lot of wells are to be placed there
- Such virgin patches are again not contiguous, rather available in pockets.
- In remaining 85 percentage area mining with all complexity exist.



Mining Complexity

- Mining in terms of development either by conventional board and pillar or longwal panel is going on in single seam and or concurrently in 2/3 seams.
- In certain seam only development has taken place while in other seam depillaring might have completed resulting either creation of simple goaf or water logged goaf (well cannot be placed over such area)
- Further in certain areas pre nationalization old/abandoned mining exist, wherein precise seam to seam co-relation survey is not available (well cannot be placed over such area also).
- In certain part of the lease opencast mining is under operation (well cannot be placed over such area also).

Thus, only such areas where single/multi seam mining by development is under progress, CBM can be tried to be exploited from virgin seam below such working by precise drilling through standing in pillars.



Outcome of Preliminary Exercise

- Among lower virgin seam below working, in all places three potential target seams are not available and hence well may not yield viable production.
- After due consideration of all above factors, it has been observed that only around **8 to 10%** of gross coal reserves locked in the leasehold area is amenable for CBM production.
- In comparison to virgin CBM block, in mining leasehold areas **only half the nos of well** may be possible to be drilled.
- However, though the exploitation percentage vis a-vis GIP reserves will be less at around 8 to 10%, **the operation will remain profitable**, in view of comparatively lower CAPEX and shared cost of Land acquisition, staffing etc.



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