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COALBED METHANE: RELIANCE's EXPERIENCE

By

Prem Sawhney

Meeting of Indo-US Working Group on Coal

April 2006

Reliance Industries
Petroleum Business (E&P)

OUTLINE

- CH_4 - Valuable Energy Resource
  - Coalbed Methane (CBM)
  - Coal Mine Methane (CMM)
  - Abandoned Mine Methane (AMM)
- RIL's CBM Blocks
- Central India CBM
- Rajasthan CBM
- Coalbed Methane - US Technologies
- Issues and Suggestions

CH_4 – VALUABLE ENERGY RESOURCE

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- CH_4 – A valuable energy resource gets generated during the process of coalification and remains adsorbed in the coal seams. This resource is being commercially harnessed by the US industry and also in some countries using following techniques:
- CBM - To exploit commercial value of gas ahead of mining and make the coal mining safe
- CMM – To realize the commercial value from methane production during coal mining operations. Adds value and avoids accidents
- AMM – To tap the remaining commercial value from residual methane gas from abandoned mines

COALBED METHANE (CBM)

- Coalbed Methane is a mixture of hydrocarbon gases, dominantly methane (90-95%) with minor amounts of other gases like carbon dioxide and nitrogen. In coalfields, it is viewed as hazardous gas and is vented out wastefully into atmosphere
- Coalbed Methane gas exists in “adsorbed” state in coal seams underground and is released when reservoir pressures are reduced by dewatering the coal seams
- A tonne of coal can hold 4 to 15 cubic meters of CBM. Higher gas content of 30 to 40 cubic metres are also reported in the US coal basins

COAL MINE METHANE (CMM)

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- Collieries in many countries are draining methane for safety reasons and various international assistance programmes are encouraging CMM activities to harness commercial value and reduce greenhouse gas emissions
- UK, USA, China, Australia and Ukraine are some of the countries where CMM projects are in operation on commercial scale
- Gas from CMM schemes is used for power generation for mine and colliery population
- There are number of deep and gassy coal mines in India. These mines can be ideal targets for starting CMM schemes resulting in:
  - Safe mining
  - GHG reduction – Carbon Credits earning potential
  - Income from sale of CMM gas

ABANDONED MINE METHANE (AMM)

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- Abandoned Mine Methane (AMM) schemes are constructed on abandoned mine sites and reclamation sites using the former mine entries as the access point to extract gas from the underground workings
- In USA, many such AMM projects are in operation in large coalfields like Black Warrior Basin, alongside CBM. AMM projects are also in operation in countries like UK, China and Australia
- AMM schemes can be commercially attractive due to their rapid payback and high return potential, compared with other types of CBM projects
- Abandoned coal mines in many coalfield areas in India can be targeted for extraction of methane. Ministry of Coal should consider this opportunity seriously and allocate such areas for extraction of methane involving CBM operators. Proven technology can be readily sourced from the US industry under the aegis of Indo-US working group on coal.

RIL'S CBM BLOCKS

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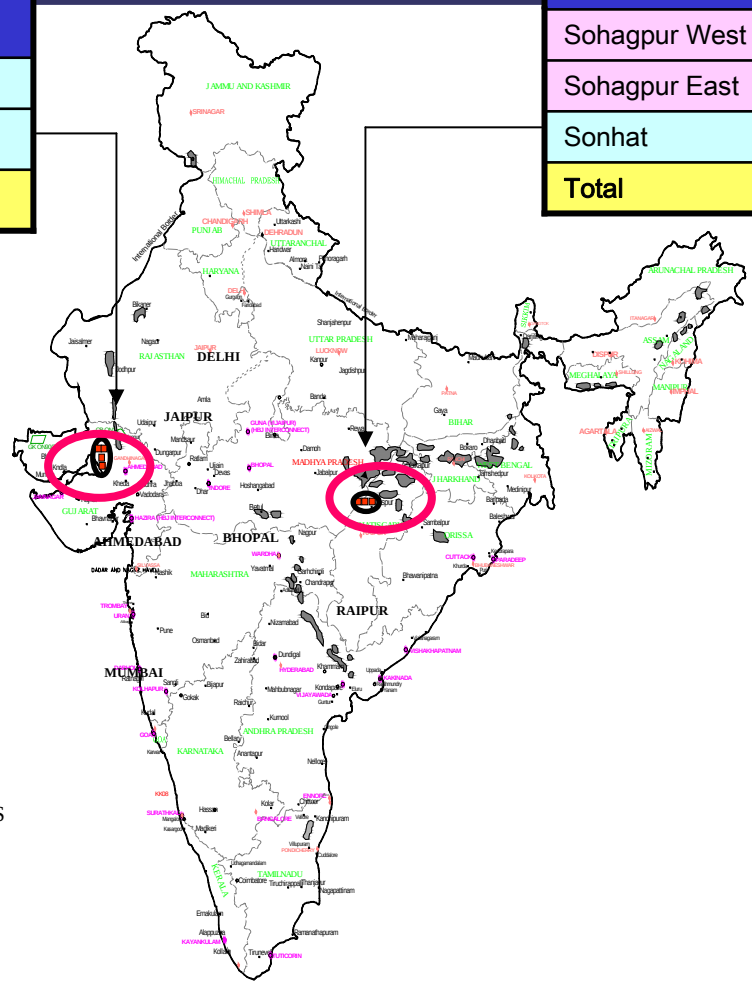
Block Name	(Area Sq. Km)
Rajasthan West	1045
Rajasthan East	1020
Total	2065

Block Name	(Area Sq. Km)
Sohagpur West	500
Sohagpur East	495
Sonhat	825
Total	1820



1ST CBM ROUND BLOCKS

2ND CBM ROUND BLOCKS

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CENTRAL INDIA CBM

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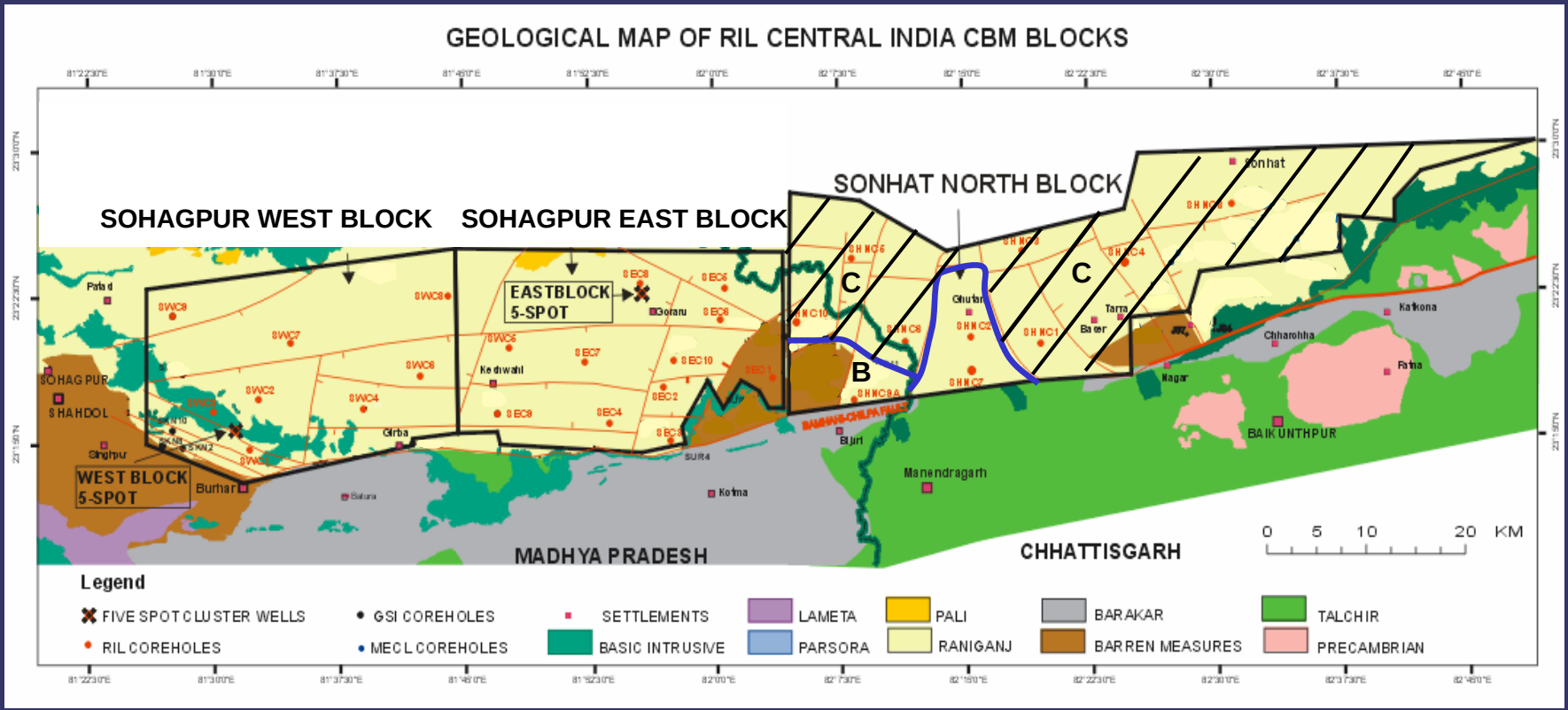
Key Findings of Phase-I work



SOHAGPUR WEST BLOCK

- Geological Assessment
- 8 coreholes
- 5 production test wells

SOHAGPUR EAST BLOCK

- Geological Assessment
- 10 coreholes
- 5 production test wells

SONHAT BLOCK

- Geological Assessment
- 10 coreholes
- 5 production test wells (Proposed)

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CENTRAL INDIA CBM

Major Achievements

- The CBM key reservoir parameters acquired:
  - Compleatable Coal thickness and coal seam continuity
  - Gas content and gas saturation
  - Permeability and its variability
- Corehole drilling:
  - Faster completion of corehole in 15 days average as against about 60 days by others.
  - Faster drilling of dolerite rocks (80-170 m) in 2-3 days as against 1 month by others
  - 100% core recovery
  - Many open hole Injection / fall off tests have been carried out first time in the country for determination of permeability of the coal seams

CENTRAL INDIA CBM

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Major Achievements

- Production well drilling
  - First time in the country, used air drilling technology for drilling CBM wells – a vastly improved technology over conventional mud drilling

  - RIL drilled and completed its production test wells in 5-spot pattern in 5 days per well average
  - Large variations in water and gas production rates from 5-spot wells indicates permeability variability even at short distances

- Hydrofracturing: 75-80 tons of proppant in the two target coal seams. A commendable job considering industry practices, especially in the country

RIL's Sohagpur CBM Blocks

- RIL has drilled sufficient information wells to map the block areas for obtaining the key reservoir parameters and drilled production test wells in two 5-spot clusters in the Sohagpur field

- Based on the results of corehole drilling, RIL has estimated the Gas-in-place resources of 3.65 Tcf in Sohagpur field. The same has been validated by The Directorate General of Hydrocarbons (DGH)

- Dewatering and CBM gas production in the 5-spot wells are ongoing for establishing the per well gas producibility rates.

CENTRAL INDIA CBM

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CBM gas show in Sohagpur Block

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CBM Gas/Water Separation in Sohagpur Block

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CBM Dewatering Operations in Sohagpur Block

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CBM Gas Flare in Sohagpur Block

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COALBED METHANE – US TECHNOLOGIES

- USA is pioneer and at the forefront of CBM technology. Recent advancements in CBM technologies by US CBM operators include the following:

Technology	Potential Impact
Horizontal and in-seam drilling	Increase ultimate recovery by up to 50%
Multilateral drilling	Increase ultimate recovery by up to 50%
Air drilling	Cut drilling time and cost by up to 50%
Optimizing stimulation (cavity comp.)	Increase ultimate recovery by 20-50%
Better well spacing	Could double NPV
Foam cement	Increase ultimate recovery by 5-10%
Coiled Tubing Frac	Increase ultimate recovery by 15-30%
Down hole gas compression	Increase ultimate recovery by 20-40%
Smaller rigs	Save $ 15,000 per location
Closed loop air drilling	Save $ 20,000-30,000/well
Casing drilling	Save $ 10,000/well
Jet slotting	Save $ 10,000/well, increase ultimate recovery by 20-50%

COALBED METHANE – US TECHNOLOGIES

- USTDA arranged CBM orientation visit for Reliance to US CBM operations, which helped in:
  - Identification of US firms involved in providing goods and services related to CBM projects
  - Meetings with US service and manufacturing companies
  - Procurement of US based services and purchases to the tune of $ 10 million

COALBED METHANE – US TECHNOLOGIES

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MAJOR SERVICES & MATERIAL PURCHASES FROM US COMPANIES

S No.	Sevices	Company
1	Technical and Operating Assistance for Sohagpur & Sonhat Blocks	M/s. Advanced Resources International Inc.,USA
2	Logging & Peforation	M/s. HLS Asia, India JV Halliburton USA
3	Cementing Services	M/s. BJ Services, USA
4	Hydrofracturing Services	M/s. BJ Services, USA
5	Adsorption Isotherm studies	M/s. Terateck Inc., USA
6	Well Test Data Analysis	M/s. Petrotel, USA
7	Well Test Data Analysis	M/s. Schlumberger Data and Consultancy Services, USA
	Gas Desorption Equipment	
9	Liquid Flow Meters (3 nos.)	M/s.NUFLO Measuring System
10	Injection Pumps and spares	M/s.TUFF Pressure Washers
11	Electronic Memory Gauges (5 nos.)	M/s. Geophysical Research Corporation
12	Batteries for EMGs (40 nos.)	M/s. Spectrum Batteries Inc. thru' M/s RJ Engineering Systems Inc.
13	Logplot software	M/s. Rock Woks
14	Casing shoes and float collars	M/s.Halliburton Energy
15	Casing & Tubing heads for Sonhat	M/s. Wellhead Inc.
16	Polished rods	M/s. HARBISON-FISCHER thru' M/s RJ Engineering Systems Inc.
17	Polished rod liner and Rod Guides	M/s. R&M Energy Systems thru' M/s RJ Engineering Systems Inc.
18	Downhole Pumps	M/s. Harbison Fischer Limited thru' M/s RJ Engineering Systems Inc.
19	Handling tools for HF's Down hole Pump	M/s. Gearench Inc, USA Thru' ACE Mark(UK) Ltd.
20	VFD for PC pumps	M/s. ABB Ltd.
21	Instumentation for Surface facility	M/s. ABB Ltd.
22	Acoustic Fluid Ranger	M/s. Echometer Company thru' M/s RJ Engineering Systems Inc.
23	Retrievable Bridge Plug - 3 sets	M/s. Kline Tools Company Inc. thru' M/s RJ Engineering Systems Inc.
24	Well heads	M/s. Larkin Products Inc.
25	Bit	M/s. RBI/Reed Hycalog
26	Floating equipment	M/s. Halliburton
27	Router	CISCO

ISSUES AND SUGGESTIONS

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CBM Area Allocation

- Only “Yes” areas, where there is no mining activity planned for next 30 or more years have been given by the Government for CBM exploration. A vast potential for CBM, in the country, is locked in the “Maybe” and “No” areas. A view needs to be taken to give these areas for CBM extraction ahead of mining. It is a common practice in CBM producing countries like USA, Australia and China
- Oil & Gas overlap areas are not considered for CBM. This again leaves enormous CBM potential locked up. Multiple operators working in the same area is a standard practice in CBM producing countries

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THANK YOU

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