

Experience Sharing on Coalbed Methane, Underground Coal Gasification and Coal Extraction Methodology

Indian Scenario

SAARC Training Workshop Program

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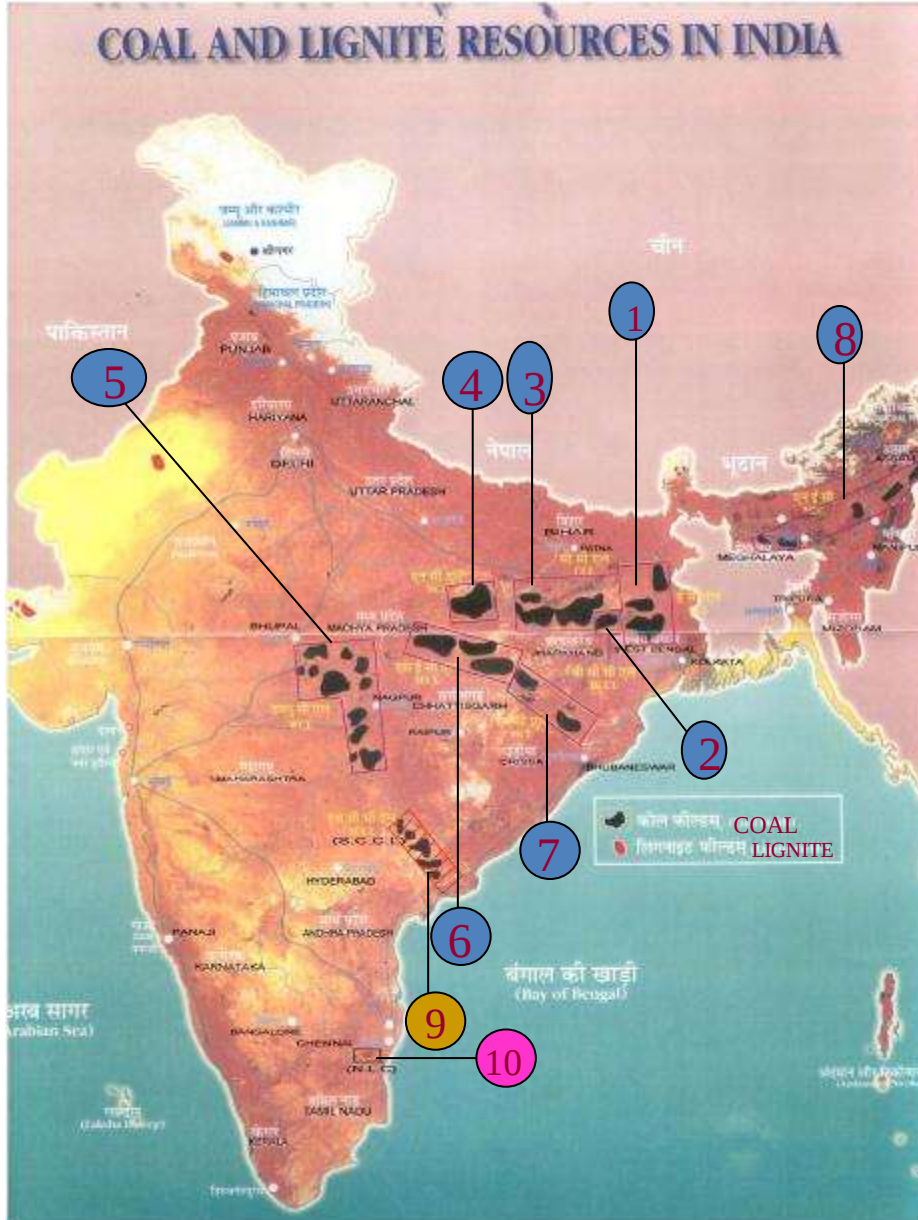
Coal in the Mining sector

- The contribution of the mining sector to GDP is about 2.3%;
- Coal is one of the major minerals with its production accounting for about 30%, (in value terms), of all mineral production in India including Petroleum;
- There are currently 573 Coal and lignite mines in India;
- The PSUs account for over 91% of coal production;
- Annual turnover of Coal & Lignite PSUs under MoC stand at about \$15 Billion;

Coal Sector Structure

- Coal is a Central Subject.
- Min. of Coal is responsible for exploration, development, production, distribution & conservation of coal & lignite
- Currently Commercial Mining is being done in Public Sector
- Coal India Ltd. (CIL) is the largest producer with over 80% share
 - CIL has 7 producing subsidiaries & a Planning & Design Institute
 - CIL has 471 mines employing close to 3.58 lac workers
- SCCL is a Joint Venture Co. with GoTelangana & Gol stake at 51% & 49%
- Neyveli Lignite Corporation - CPSU for lignite production & Power generation.

LOCATION OF COAL & LIGNITE RESOURCES OF INDIA



CIL : COAL PRODUCING SUBSIDIARIES

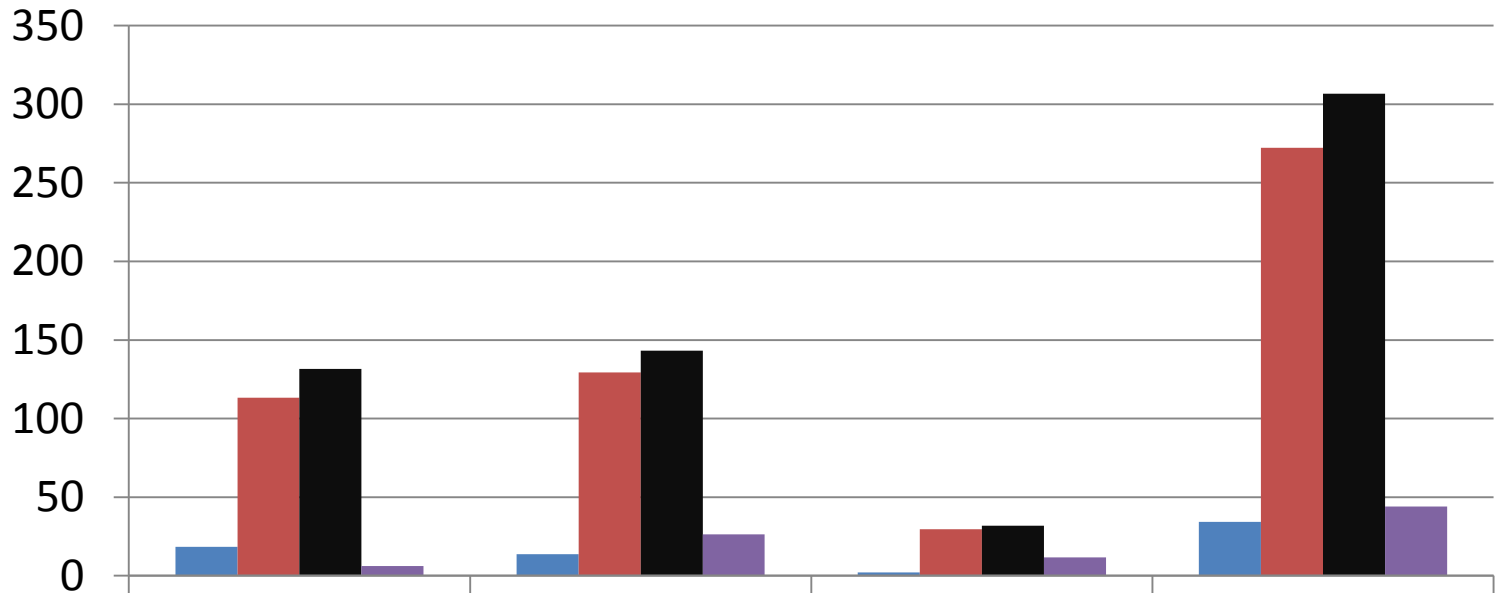
- EASTERN COALFIELDS LTD. (1)
- BHARAT COKING COAL LTD. (2)
- CENTRAL COALFIELDS LTD. (3)
- NORTHERN COALFIELDS LTD. (4)
- WESTERN COALFIELDS LTD. (5)
- SOUTH EASTERN COALFIELDS LTD. (6)
- MAHANADI COALFIELDS LTD. (7)
- NORTH EASTERN COALFIELDS. (8)
(A UNIT UNDER CIL(HQ))

OTHER COAL COMPANIES

- SINGARENI COLLIERIES CO. LTD. (9)
- NEYVELI LIGNITE CORPORATION (10)

COAL & LIGNITE RESOURCES

Billion Tonnes



	Proved	Indicated	Inferred	Total
Coking	18.435	13.815	2.101	34.352
Non-Coking	113.179	129.426	29.639	272.244
Total Coal	131.614	143.241	31.740	306.596
Lignite	6.18	26.29	11.65	44.12

Highlights of Coal Sector - 2014-15

- Over all coal production: 610.84 mt (8.3% growth);
- Overall lignite production: 48.25 mt (9% growth);
- Overall coal despatches: 607.65 mt (6.2% growth);
- Supply to power sector: 552.80 mt (11% growth);
- Total coal imports: 217.80 mt (Coking-43.8 mt & Thermal 174.1 mt) and forms about 26% of total consumption of 823.8 mt;
- Coal based generation: 800.3 Bkwh (12% growth) & forms 76% of total generation of 1048.4 Bkwh;
- Out of 271 GW of total capacity as of end of March 2015, 164 GW or 61% is coal based;

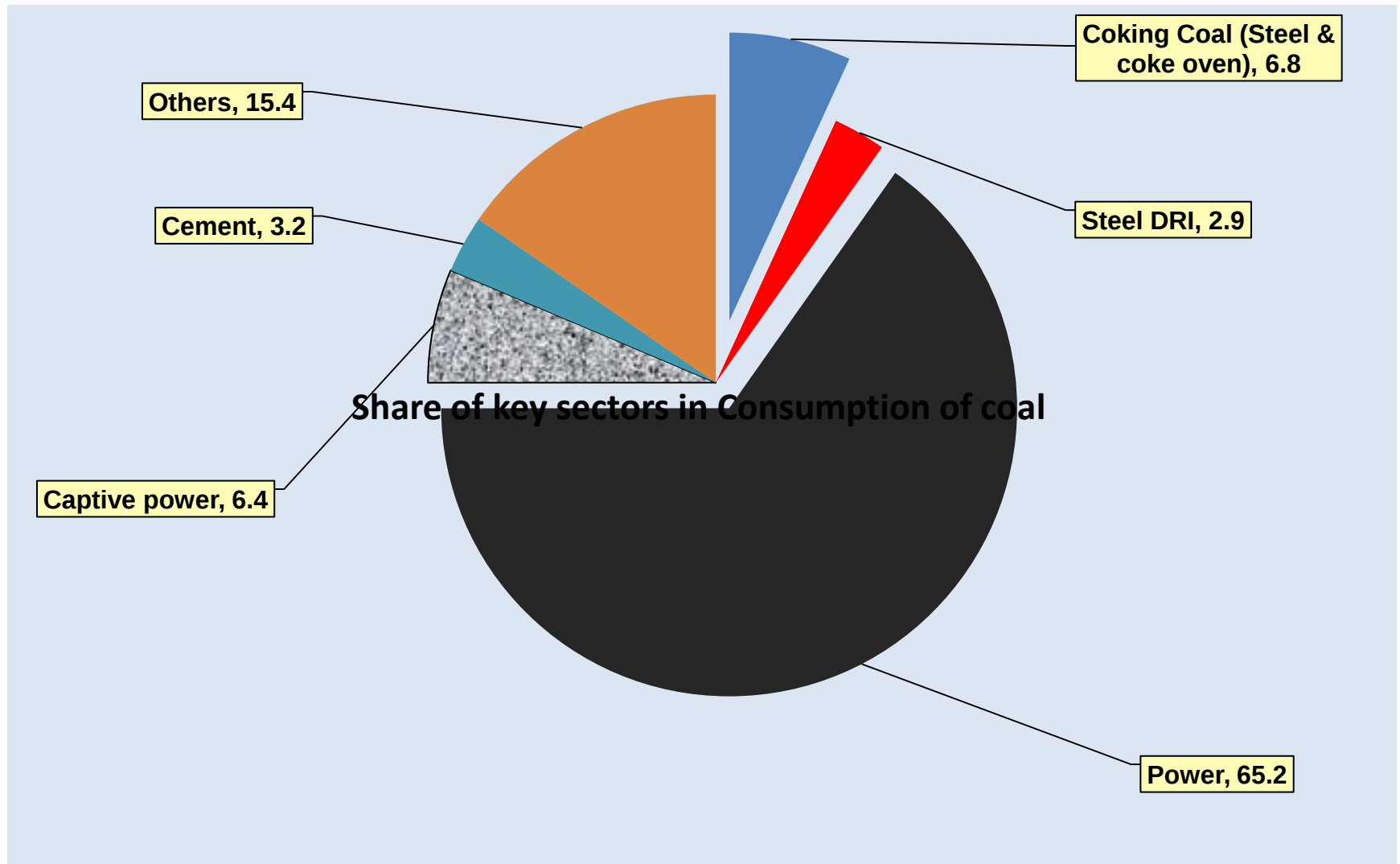
Trend in Coal Demand, Consumption & Production

(Million Tonnes)

Five Year Plan Terminal Year	Demand	Consumption	Production	Gap	Coking coal imports	Thermal coal imports	Total coal imports	Imports As % of consumption
VII Plan 1989-90	222.0	199.8	200.9	(+) 1.1	4.5	-	4.4	2.2%
VIII Plan 1996-97	311.0	303.5	289.3	(-) 14.2	10.6	2.5	13.2	4.3%
IX Plan 2001-02	354.3	351.9	327.8	(-) 24.1	11.1	9.4	20.5	5.8%
X Plan 2006-07	474.2	463.8	430.8	(-) 33.0	17.9	25.2	43.1	9.8%
XI Plan 2011-12	696.0	627.5	540.0	(-) 87.5	31.8	71.0	102.8	16.4%
2013-14	769.3	729.53	564.7	(-)164.83	37.19	131.25	168.44	23.1%
2014-15	787.03	823.80	610.84	(-)212.96	43.80	174.10*	217.90	26.5%
XII Plan 2016-17 P	980.50		795	(-) 185.5	35.5	150.0	185.5	18.9%

Note: * Of which Imports by Power Sector – 91.20 mt; Coal Production is envisaged to reach to about 1.5 Bt in 2019-20

% Share of key sectors in Consumption of Coal



Others includes Fertilizer, Brick, Cokeries and misc. - others.

Coal Extraction Methodology

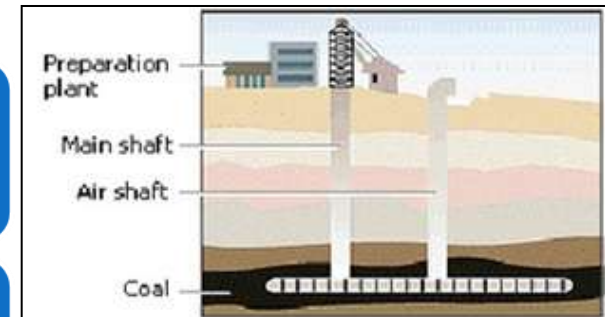
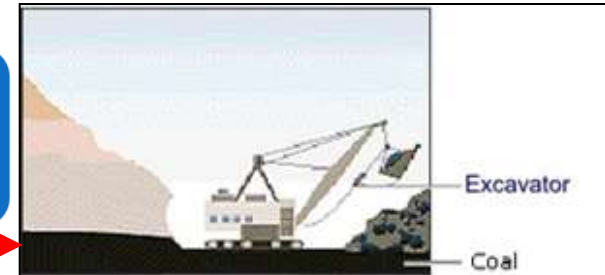
Two main Mining Methods –

- Opencast
- Underground

Choice is largely dependent on depth, extent, quality and geology of the deposit

Majority of world's coal production is coming from Opencast Mines (OCMs)

More than 90% of coal production in India is through OCMs



Coal Mining

- To keep pace with rapidly increasing demand for coal, particularly the power sector, large scale opencast mining operations have been taken up over the period since nationalisation of coal industry;
- Mines are being planned with higher stripping ratios and higher depths even up to 400 meters;

OCM: Coal Extraction



OB Casting by Dragline to expose coal



29 7 2010

OB Removal by Shovel-Dumper



Introduction of Eco-friendly Technologies

❑ Opencast Mines

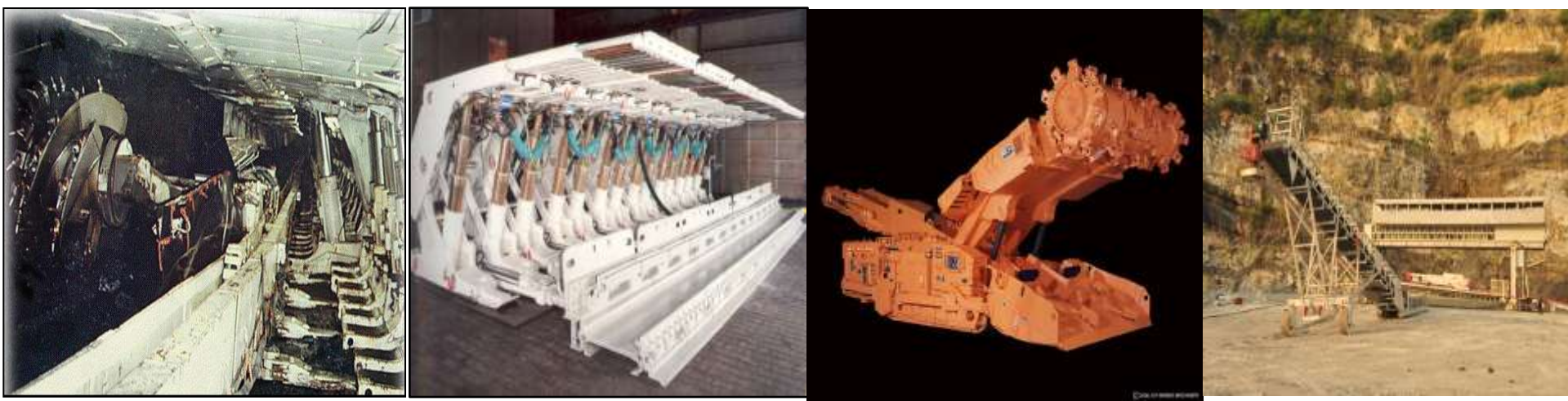
- ✓ Surface Miner Technology has been deployed in 23 mines of Coal India Ltd, one mine of SCCL;
- ✓ In-pit crushing and conveying system is operational in one mine each of CIL and SCCL;
- ✓ Bucket Wheel Excavators and Spreaders for Lignite mining are being extensively used in NLC;



Introduction of Eco-friendly Technologies

❑ Underground Mines

- ✓ Continuous Miner Technology has been Deployed in 8 Mines ofCIL and two Mines of SCCL;
- ✓ Longwall Technology is already functional in two mines of SCCL and two mines of CIL;



Reclamation of Mined out areas

- ✓ In Coal India Limited (CIL) on an average about 600 Ha of land per annum is getting reclaimed and about 1.5 million Plants are being planted;
- ✓ For each Hectare of Forest land diverted about 2.50 Ha is being reforested;
- ✓ In Neyveli Lignite Corporation (NLC), every year about 100 Ha of land is reclaimed and 90% of it converted for agricultural and plantation use ;

Stages of Eco-restoration – CCL/CIL

1



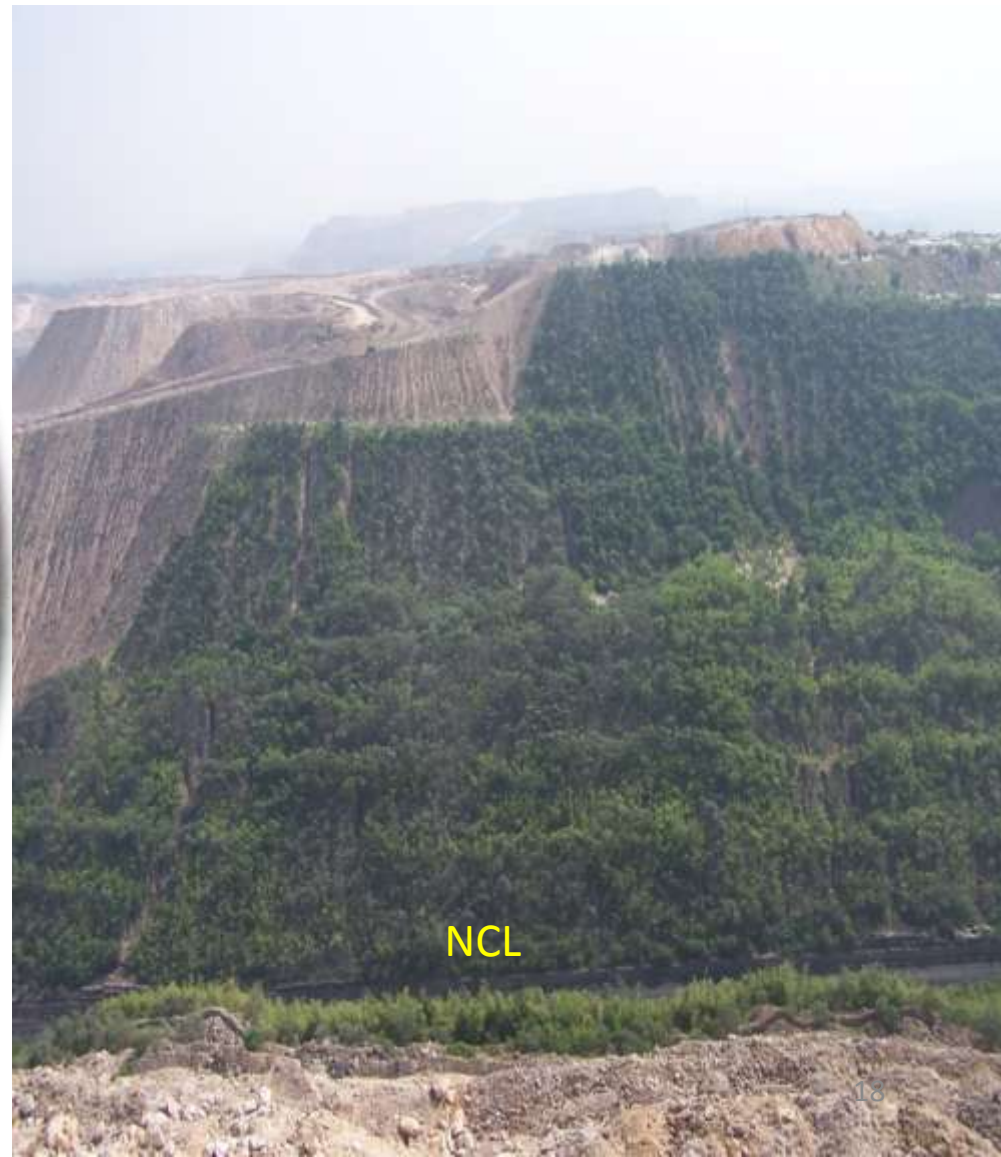
2



3



Technical & Biological Reclamation of OB dumps



- ✓ Best Mining Practices being followed for reclamation of mined out areas;



Reclaimed Mined Out Area- WCL/ CIL



Stages of eco-restoration – SCCL



At RK-5B, Srirampur Area



At VK-7, Kotagudem Area



At PVK-5, Kothagudem Area

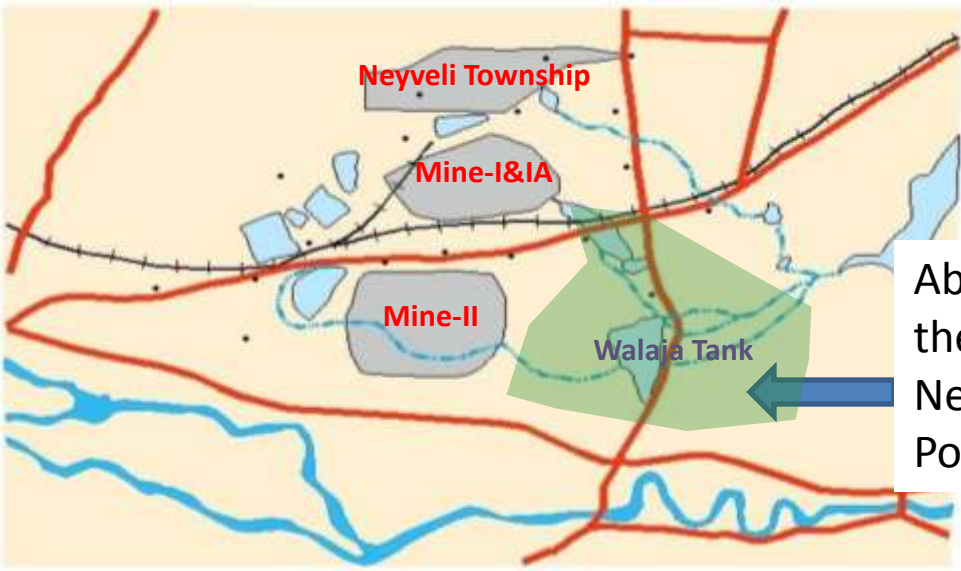


At Goleti 1&1A, Bellampalli Area

✓ Water Management

- Water being pumped from the mines is being supplied for domestic, industrial and agricultural purposes;





Water from Neyveli benefitting surrounding region

About 54 cusec of water irrigating the area of 20000 Acre around Neyveli and Benefitting the Population of about one Lakh



Challenges in Coal development

- Tall order of 1.5 Bt (CIL-1 Bt, SCCL-0.080 to 0.1Bt, Captive - 0.4 Bt)
- Compliance of Stringent environmental laws;
- Land acquisition, Rehabilitation & Resettlement;
- Quick development of rail infrastructure for coal evacuation;
- Technology development particularly for underground mines;
- Review of contract management procedures;
- Restrictive approach for private investments limited to captive mining till recently;
- Need for commercial mining by private majors;
- Enhanced Exploration for future resource distribution;

Reforms

- Coal concessions are being offered through competitive bidding for captive mining;
- Commercial mining by private sector is under consideration;
- Market based mechanism for distribution of coal produced by PSU Companies;
- Need for strengthening Transmission systems & DISCOMS;

CBM Scenario in India



CBM in India

- In order to harness CBM resources in the country , CBM Policy was formulated in 1997.
- MoU was signed on 09.09.1997 between MoP&NG & MoC
 - ✓ It provides framework to act in co-operative manner for development of CBM
 - ✓ MoPNG to administer the CBM projects and DGH was made the implementing agency.
- Model Contract drafted in 1998
- Identification of blocks, preparation of Information Dockets & Data Packages of the offered blocks initiated in 1999
- **Till date, 33 CBM blocks have been awarded in 4 rounds of CBM bidding.**

State-wise distribution of CBM Resources in India

Sl. No.	STATE	ESTIMATED CBM RESOURCES (IN BCM)	ESTIMATED CBM RESOURCES (IN TCF)
1	JHARKHAND	722.08	25.5
2	RAJASTHAN	359.62	12.7
3	GUJARAT	351.13	12.4
4	ORISSA	243.52	8.6
5	CHATTISGARH	240.69	8.5
6	MADHYA PRADESH	218.04	7.7
7	WEST BENGAL	218.04	7.7
8	TAMILNADU	104.77	3.7
9	TELANGANA & ANDHRA PRADESH	99.11	3.5
10	MAHARASHTRA	33.98	1.2
11	NORTH EAST	8.50	0.3
TOTAL CBM RESOURCE		2599.48	91.8

*Conversion factor: 1 cubic metre = 35.3147 cubic feet

Reserves Established in CBM blocks

SL. NO.	BLOCK NAME	CONSORTIUM (PI)	APPROX AREA (SQ.KM.)	CURRENT STATUS	GIIP IN TCF
1	RANIGANJ SOUTH	GEECL (100)	210	ON PRODN.	1.92
2	JHARIA	ONGC (90) - CIL(10)	85	UNDER DEV.	0.52
3	RANIGANJ NORTH	ONGC (74) - CIL (26)	350	UNDER DEV.	0.26
4	RG(E)-CBM-2001/1	EOL (100)	500	UNDER DEV.	2.15
5	SP(W)-CBM-2001/1	RIL (100)	500	UNDER DEV.	1.96
6	SP(E)-CBM-2001/1	RIL (100)	495	UNDER DEV.	1.69
7	BK-CBM-2001/1	ONGC (80) - IOC (20)	95	UNDER DEV.	1.06
8	NK-CBM-2001/1	ONGC (80) - IOC (20)	340	UNDER DEV.	0.34
TOTAL CBM RESERVES ESTABLISHED					9.90

CBM Production Projection

CBM Block	Operator	Projected figures are in MMSCMD			
		Actual 2014-15	2015-16	2016-17	2017-18
Jharia	ONGC	0.01	0.01	0.01	0.06
Raniganj (North)	ONGC	0.00	0.00	0.01	0.10
BK-CBM-2001/I	ONGC	0.00	0.00	0.12	0.16
NK-CBM-2001/I	ONGC	0.00	0.00	0.03	0.14
Raniganj (South)	GEECL	0.36	0.52	0.68	0.85
RG(East)-CBM-2001/I	Essar Oil	0.25	1.04	2.36	3.33
SP(East)-CBM-2001/I	RIL	0.00	0.00	0.00	0.00
SP(West)-CBM-2001/I	RIL	0.00	0.12	0.76	1.13
Total		0.62	1.69	3.97	5.77

Grant of right to exploration and exploitation of CBM to CIL & its subsidiaries

- Approval of CCEA accorded on 19.12.2013
- Accordingly, in a meeting held on 10.07.2015, Committee of Secretaries has permitted Coal India Ltd and its subsidiaries to explore and exploit CBM from its coal mining lease hold areas
- A Notification in this respect has been issued by MoP&NG.
- CIL has identified blocks for CBM extraction and has prepared action plan for the same.

A demonstration project for CMM established at Moonidih, BCCL/CIL in association with UNDP/GEF; methane produced is being used in 500 kW IC engines for Power generation



India CBM/CMM Clearing House

For development of CBM/CMM resources, Ministry of Coal and United States Environmental Protection Agency (US EPA) established **CBM/CMM Clearinghouse** in CMPDI. CBM lab was also established in CMPDI which provide services in CBM related studies.

- Field Desorption Study
- Gas composition
- Adsorbed Phase Gas storage Capacity
- TOC (Total Organic Carbon)
- Proximate Analysis
- Ultimate Analysis
- Rock Eval Pyrolysis

Underground Coal Gasification

- UCG process is being in vogue since long it has not attained global acceptability mainly due to environmental concerns and due to easy availability of petroleum and natural gas.
- Development of UCG is under active consideration of the Govt and a gazette notification has been issued in 2007 thus defining UCG as an end-use.
- A policy for UCG is under formulation at the Govt. level.
- The process of UCG is yet to be established under Indian geo-mining conditions and efforts are on to establish UCG technology.
- 2 Coal and 5 lignite blocks outside CIL command areas and 2 coal blocks within CIL have been identified for development of UCG.

Way Forward

- Coal will play a significant role in supporting energy plans of India for quite some time in to the future;
- Coal production envisaged to reach about 1.5 billion tonnes by 2019-20;
- Cooperation from state governments highly critical for land related issues and R&R for both mining projects and rail evacuation lines;
- Emphasis laid on Technology development and modernisation;
- Emphasis on crushing, sizing & washing of coal;
- Adoption of international best practices for sustainable coal mining;
- Transparent mechanism for resource allocation;
- Coking coal imports will continue due to resource capacity constraints; need for strengthening port capacities;

Thank You