



Neyveli Lignite Corporation Limited

welcomes

**INDO- US WORKING GROUP ON
COAL AND LIGNITE.**

**AGENDA FOR
INDO-US WORKING GROUP ON
COAL AND
LIGNITE DEPOSITS IN INDIA-NLC**

ABOUT

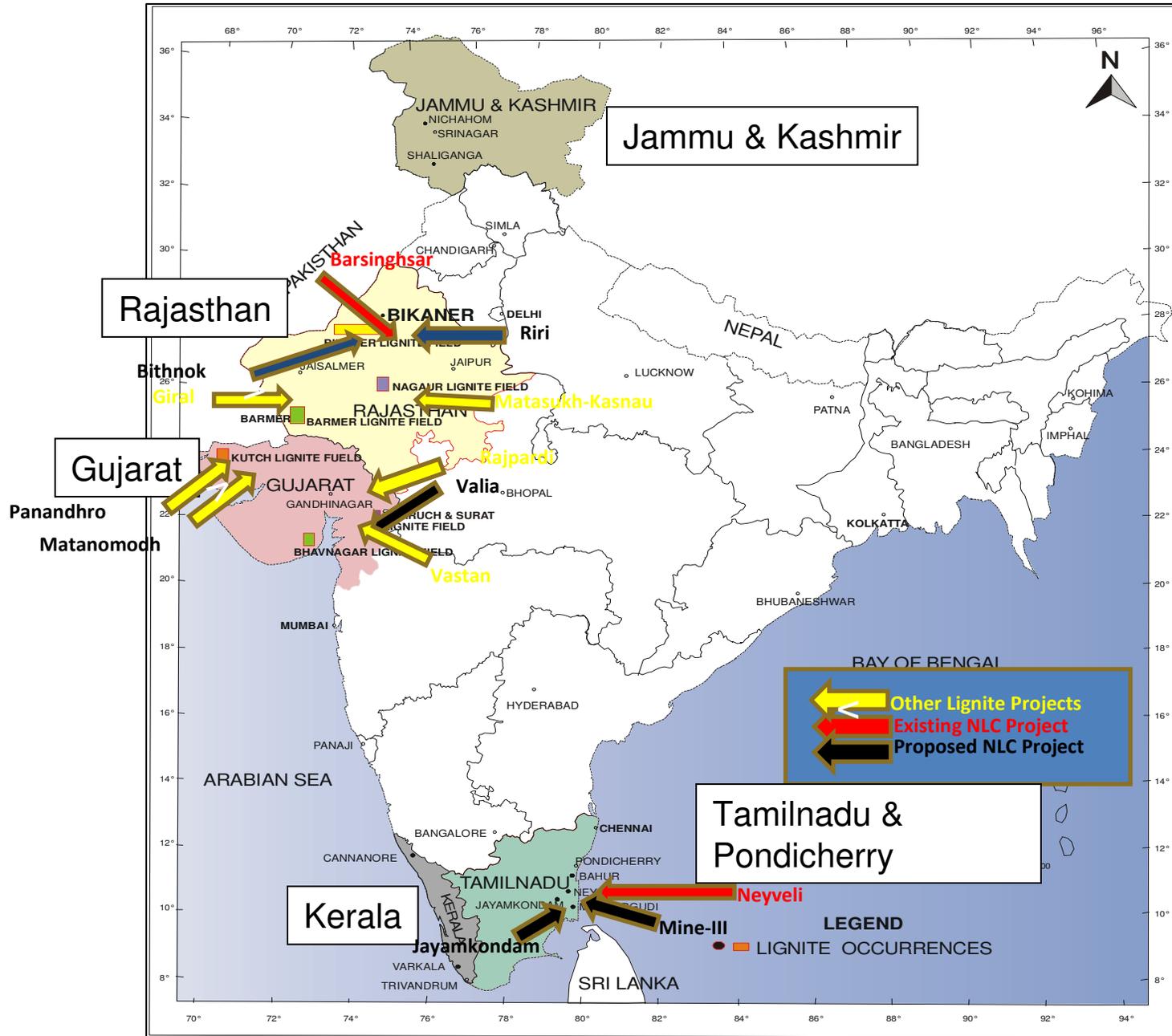
NEYVELI LIGNITE CORPORATION LTD

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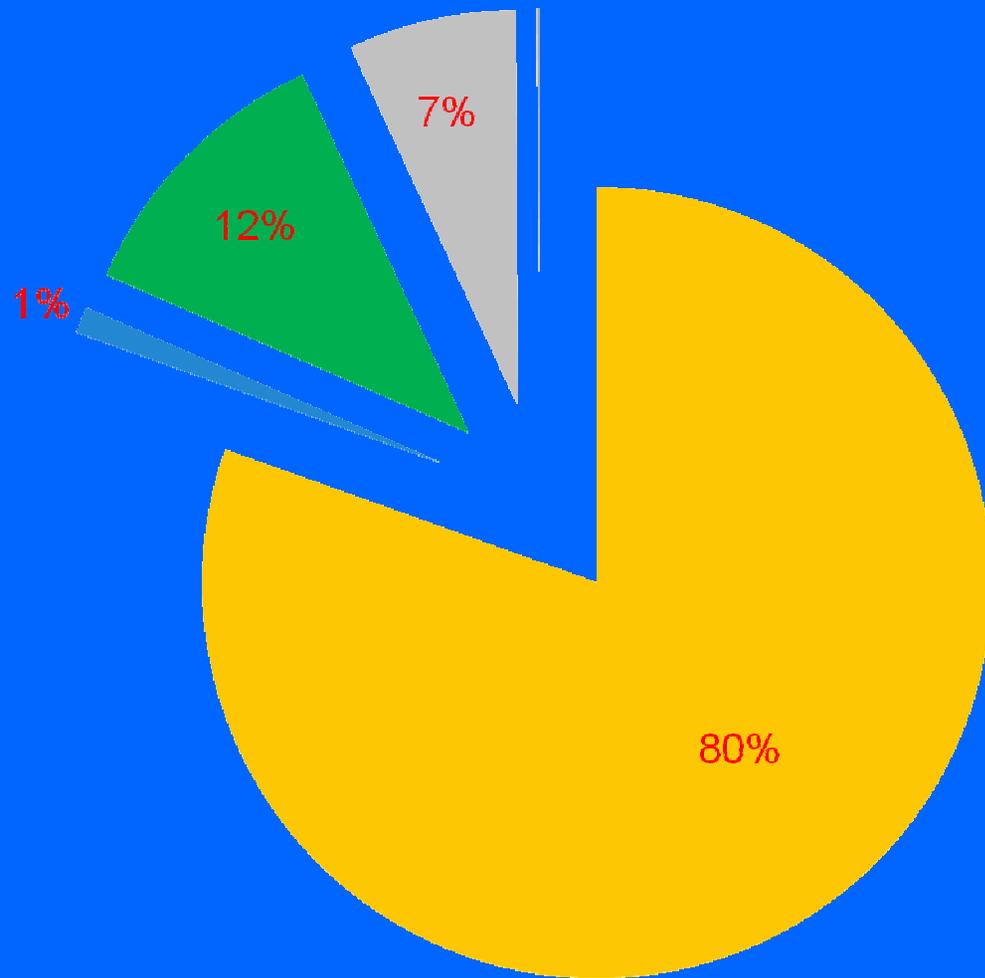
Neyveli Lignite Corporation Limited is a Government of India Undertaking established on 14th November, 1956 engaged in Mining Lignite and using the same for Power Generation.

LIGNITE MINE PROJECTS IN INDIA



LIGNITE RESOURCES IN INDIA

Total Lignite Reserve: 39 BT



	Reserves in MT
■ Tamilnadu	31327
■ Puducherry	417
■ Rajasthan	4485
■ Gujatrat	2663
■ Jammu & Kashmir	28
■ Kerala	10
■ West Bengal	1

LIGNITE QUALITY (Range)

Moisture	:	50 – 55 %
Ash	:	2 – 5 %
Volatile Matter	:	22 – 26 %
Fixed Carbon	:	18 - 22 %
GCV (Kcal / Kg)	:	2600-3000

MAIN UNITS OF THE COMPANY



Three Lignite Mines of capacity 24 MT per annum

Mine	Lignite	Over Burden
Mine-I	10.5 MTPA	57.75 Mm ³
Mine-IA	3.0 MTPA	21.00 Mm ³
Mine-II	10.5 MTPA	51.00 Mm ³
Total	24.0 MTPA	129.75 Mm ³

Three Thermal Power Stations of capacity 2490 MW

- ❖ TPS-I (6x50 MW+3x100MW) 600 MW
- ❖ TPS-II (7x210 MW) 1470 MW
- ❖ TPS-I Expansion (2x210 MW) 420 MW



MINE-I

- **Capacity- 10.5 Million Tonnes of Lignite per annum, with OB excavation of 57.75 Mm³**
- **Continuous mining technology with Bucket Wheel Excavators, Conveyors and Spreaders.**
- **Regular Lignite mining commenced in May 1962.**
- **Meets the fuel needs of TPS-I (600 MW) and TPS-I Expn. (420 MW).**



MINE-II



- ❖ **Capacity –10.5mt of Lignite /Annum, and OB Excavation of 51Mm³**
- ❖ **Meets the fuel needs of TPS-II (1470 MW).**
- ❖ **Regular Lignite mining commenced in March 1985.**

MINE-IA



- ❖ **CAPACITY – 3 MT PER ANNUM OF LIGNITE AND 21 Mm³ OF OVERBURDEN**
- ❖ **LIGNITE PRODUCTION COMMENCED ON 30th MARCH, 2003**

- ❖ **MEETS THE FUEL REQUIREMENT OF AN INDEPENDENT POWER PRODUCER-M/s ST-CMS AND OTHER INTERNAL USES.**
- ❖ **PROJECT IMPLEMENTED WITHOUT COST & TIME OVER-RUN**



Bridge Type 1400 L BWE in operation



Overall view of Benches



700 Litre BWE operation in Lignite



PROJECTS UNDER IMPLEMENTATION



Name of the Project	Capacity
At NEYVELI, TAMILNADU	
Mine-II Expansion	4.5 MTPA (22,959.3 Mill. Rs.)
TPS-II Expansion	2 X 250 MW (24,535.7 Mill. Rs.)
At BARSINGSAR, RAJASTHAN	
Barsingsar Mines	2.1 MTPA (2,546.0 Mill.Rs)
Barsingsar Thermal	2 X 125 MW (16,260.9 Mill. Rs)
AT TUTICORIN, TAMILNADU	
Coal based power project.	2 X500 MW (49,095.4 Mill. Rs.)



THE FOLLOWING PROJECTS ARE UNDER FORMULATION

Name of the project	Capacity Addition	
	Mining (MTPA)	Power (MW)
Bithnok (Barsingsar Expansion) Mine cum power project	2.25	250
Hadla Lignite Mine cum Power Project (Barsingsar Extn)	2.50	250
Valia Lignite Mine cum power Project at Gujarat	8.00	1000
Jayamkondam Lignite Mine cum power Project	13.50	1600
Mine-III linked to TPS-III	8.00	1000
Coal Mine cum power project at Orissa	15.00	2000
Thermal Power station in lieu of existing TPS-I	1.50	1000
Coal based power project at Madhya Pradesh	--	1000
Coal based power project at Uttar Pradesh	--	2000
Coal based Mine & power project at Chattisgarh	11.00	2000
TOTAL (Estimated Outlay 827 Billion Rs.)	61.75	12100

AGENDA

AGENDA

- I. Dump Slope Stability Studies**
- II. Seepage Water Control on Overburden Benches**
- III. Study of usage of Long Boom Draglines and other Bridge boom equipments**
- IV. Clean Coal Technologies (Coal Bed Methane & Underground Coal Gasification)**
- V. Technical Appraisal for Mine-III for finding Alternative Mining Technology for Mine-III Project.**

SALIENT FEATURES OF MINE WORKING AT NEYVELI

Overburden Thickness	:72 to 110 m
Lignite Thickness	:10 to 23 m
Number of Excavation Benches	:5
Height of Excavation Bench	:20-25 m

Method of Working:

Open cast mining utilizing Specialized Mining Equipments like Bucket wheel Excavators, (1400 lit & 700 Lit capacity) for Excavation, belt conveyors for transportation & spreaders (20000 & 11000 T /hr) for dumping.

GEOLOGY & GEO HYDROLOGY

- I. The main Overburden formations consists of argillaceous & Ferruginous sandstone and clays with aquifer sands.**
- II. The sandstones constitute a major portion of the overburden and they are fine to coarse grained.**
- III. The annual rainfall varies between 860 mm and 2070 mm with an average of 1200 mm.**
- IV. A huge reservoir of ground water exists below the entire lignite bed, exerting an upward pressure of 6 to 8 kg/cm², which is tackled by an effective ground water management system.**
- V. The pressure of the artesian aquifer is being controlled by pumping (around 49,000 gallons per minute).**
- VI. Drawdown requirement depends upon the disposition of the bottom of lignite.**

AGENDA I - DUMP SLOPE STABILITY STUDIES

- I. Due to confined aquifer, water seepage on lignite floor is unavoidable and waste is dumped in watery floor. Hence suitable technology & dump management is required.**
- II. Stabilization of dumps considering SME technology.**
- III. Slope monitoring techniques/measures for variations in Soil condition, Excessive seepage due to higher permeability, seismic instability etc.**
- IV. Active Mining Zone- System of monitoring for any instability of dumps of total height of 60m or more**
- V. Other effective methodology of managing high dumps.**

SLIDING OF DUMPS



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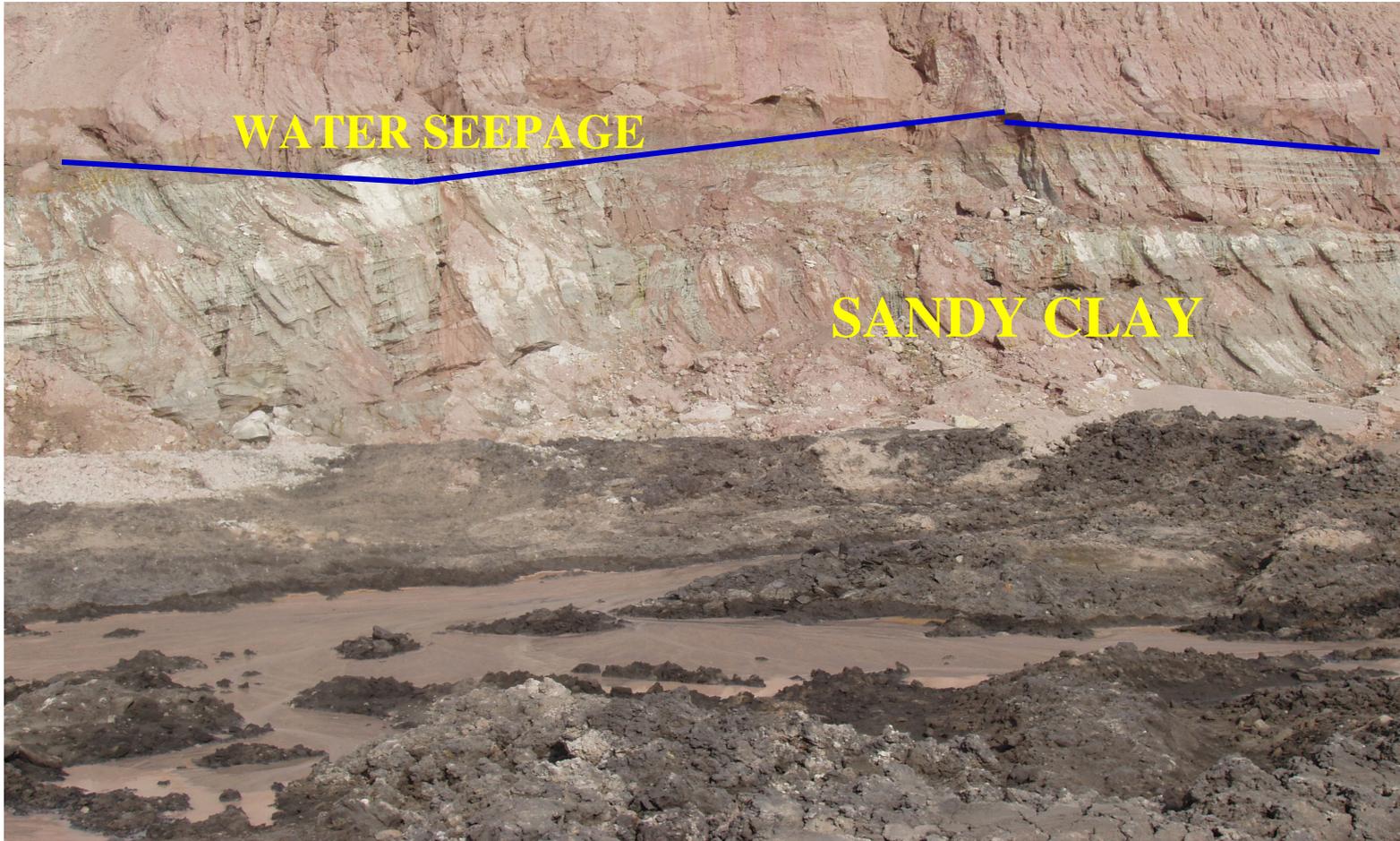
SLIDING OF DUMPS



AGENDA II - SEEPAGE WATER CONTROL IN OVERBURDEN BENCHES

- I. In the Neyveli Lignite Basin a Semi-confined aquifer is persisting apart from the sub-surface water and the confined aquifers. It gives lot of problems in excavation, transportation and dumping of Overburden and lignite.**
- II. Expertise is required for fixing of the design parameters with respect to spacing, diameter of holes etc and equipping the same for the required pumping capacity.**
- III. It was observed that similar situation has been prevailing in Jewett Mine of Westmoreland Coal company in Texas State. The methodology seems workable at Neyveli also to control the seepage water in the overburden benches.**

MINE II – Water Seepage In The Middle of Top Overburden Bench

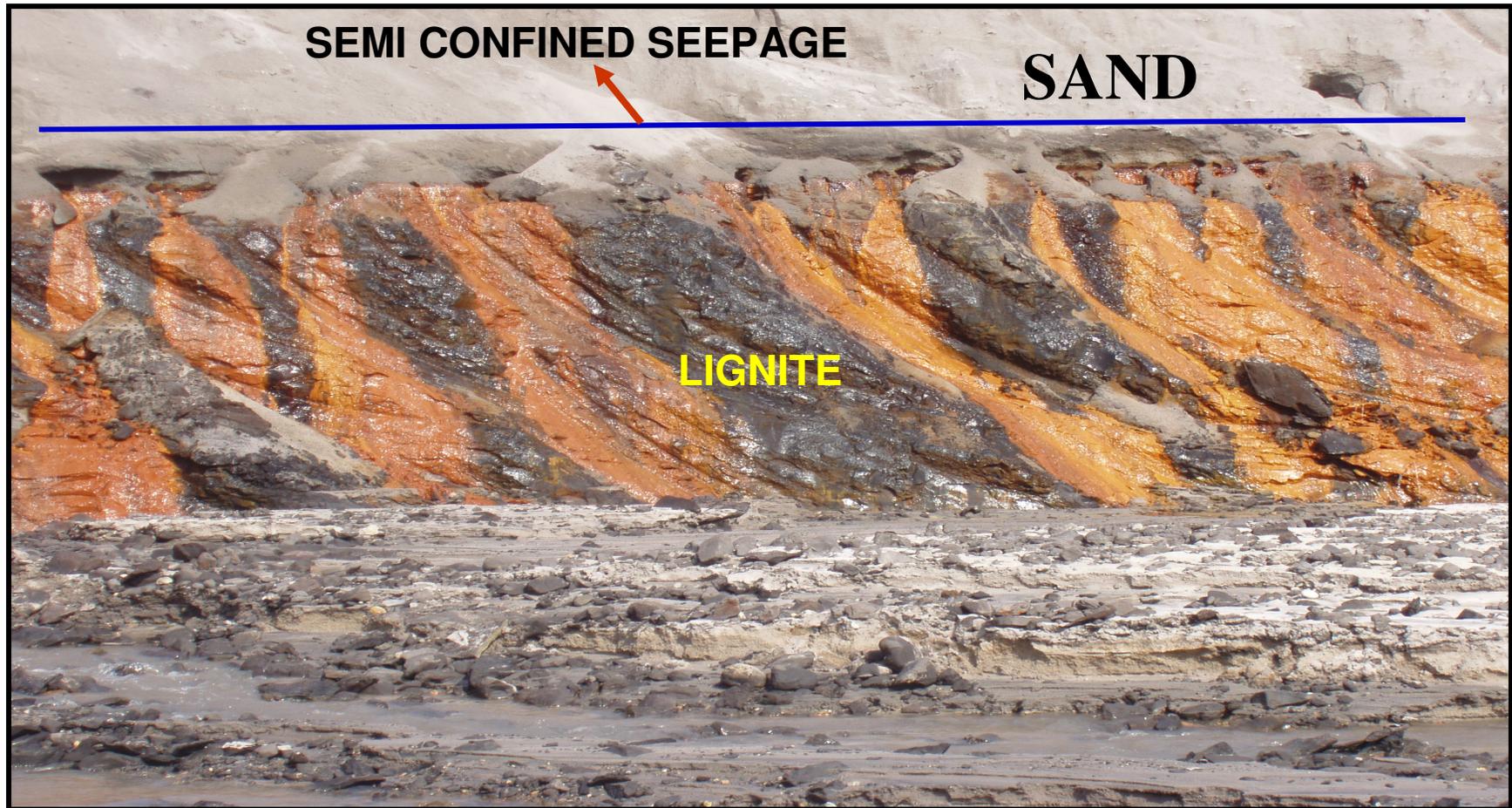


SCENARIO PRIOR TO SEEPAGE CONTROL IN TOP BENCH OF MINE -II



MINE-II - Lignite Bench L1

Semi Confined Seepage above Top of Lignite



SEEPAGE WATER FROM UPPER LAYERS FLOWING ACROSS THE LIGNITE BENCH



SEEPAGE WELLS (MINE-II)



GWC WELLS



SWC PUMPING



Agenda III - Study on usage of Long Boom Draglines or other Bridge Boom Equipments

- 1. Open Aquifer (sump) width required from lignite face is around 200 mtrs**
- 2. Economics of dragline with long boom or other Bridge Boom Equipments and practical implications for deploying in cyclone (Max. Wind speed 130 km/hr.) and high monsoon (Max. annual rainfall is 2070 mm) prone areas in lignite operation.**
- 3. Stickiness of overburden material in the dragline bucket-discharge time.**
- 4. Quantum of handling/annum = 4 Mill m³ to 8 Mill m³**
- 5. Availability of such suitable draglines in US with the details of regarding sizes, capacity and manufacturers or other bridge boom equipments.**

VIEW OF BOTTOM BENCH, SUMP AND INSIDE DUMPING



AGENDA IV - CLEAN COAL TECHNOLOGIES

- 1. Neyveli Lignite Corporation Ltd, being a large power producing company, desires to develop various source of energy.**
- 2. Till now entire power generation of NLC is through lignite mined from its mines**
- 3. In order to diversify and also with a view to exploit vast deep seated and un-mineable lignite resource, NLC started its endeavour to enter into field of Underground Coal Gasification and CBM from lignite.**

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AGENDA IV - CLEAN COAL TECHNOLOGIES

4. To gainfully utilize the vast potential of lignite deposits which are uneconomical for conventional mining, the following Non-conventional/clean coal technologies are considered.

a)Coal Bed Methane (CBM)

b)Underground Coal Gasification (UCG)

A. COAL BED METHANE (CBM)

TAMILNADU LIGNITE FIELD AS CBM RESOURCE:

Tamilnadu has the largest established resource of Lignite in country. These are mainly developed in the following three sub basins:

1.Bahur

2.Neyveli

3.Mannargudi

CBM PROSPECTS – MANNARGUDI TAMILNADU

- 1. With vast Lignite Resource of 22 BT at deeper depth (200 to 550m), Mannargudi block has Commercial Potential for development as CBM field.**
- 2. Groundwater in Mannargudi Lignite Field occurs in Water Table, unconfined and confined conditions.**
- 3. The quality of Groundwater is good to acceptable quality for Irrigation and domestic uses.**

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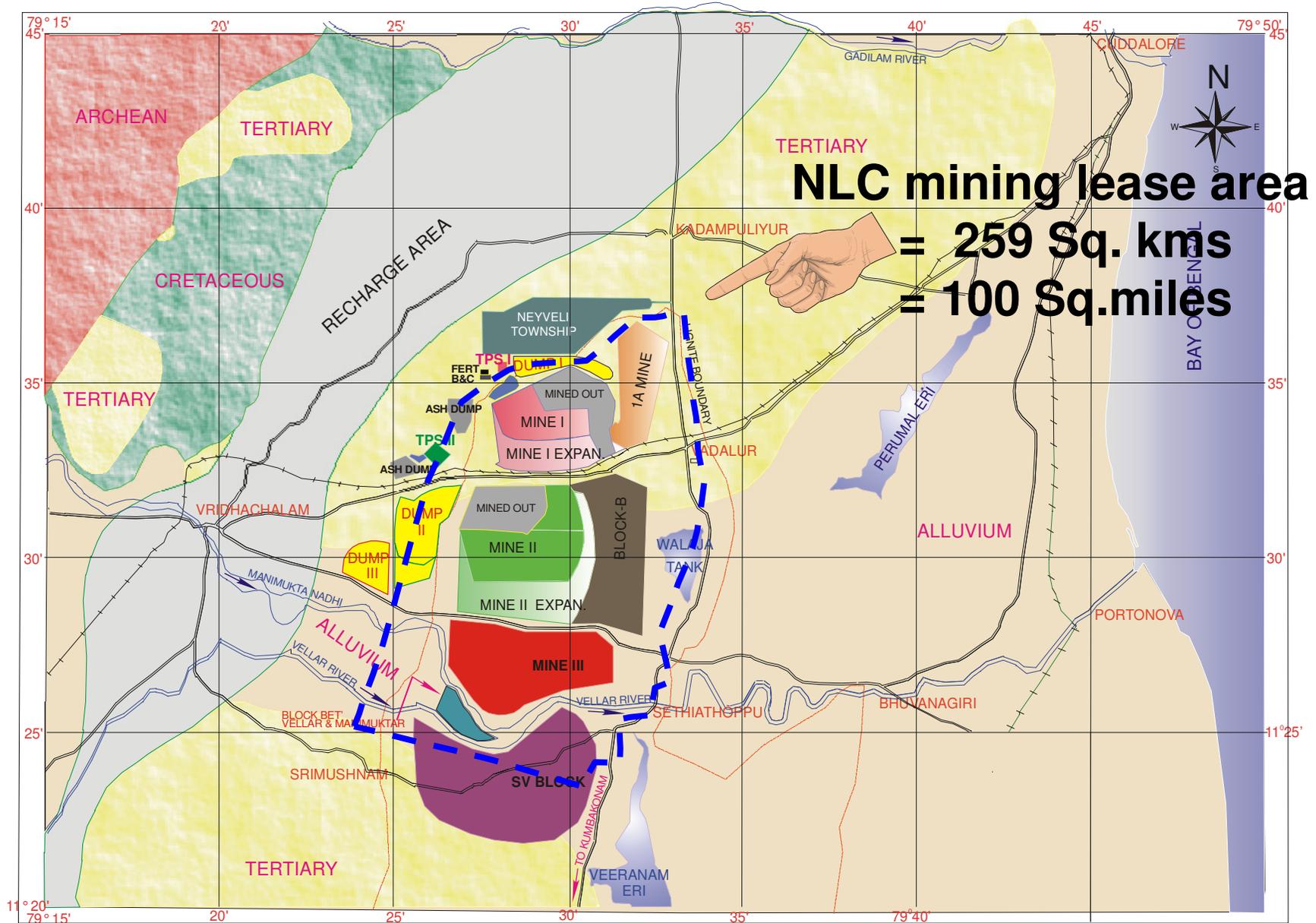
CBM PROSPECTS – MANNARGUDI TAMILNADU

- 4. The Mannargudi Lignite Deposit is being studied for CBM which is having gas content of about 0.6 to 1.0 M³/ton with hydrocarbon content of 75%**
- 5. NLC needs assistance from United States for CBM development as Mannargudi Lignite Field is geologically similar to powder River Basin of Wyoming State in USA, where CBM development activities are going on.**

DEVELOPMENT OF COAL MINE METHANE (CMM) IN NLC'S LEASEHOLD AREA

- 1. In Neyveli basin, total available reserves of Lignite for CMM Development is 5500 MT.**
- 2. Geological setup is similar to Powder River basin of USA.**
- 3. 2400 MT reserves are already in NLC's Leasehold. Additionally 1000 MT in Jayamkondam is applied for Lease.**
- 4. The above areas can be taken for immediate studies.**
- 5. The above blocks have been considered for CMM assessment**

NLC's Leasehold area



ASSISTANCE IS REQUIRED IN THE FOLLOWING FIELD

- 1. Exploration and Estimation of Gas in place (GIP).**
- 2. Methods to extract Methane from Coal/Lignite.**
- 3. Assistance required from USA for Exploration and Development of Coal Mine Methane in Neyveli Lignite Mines Area.**

B. UNDERGROUND COAL GASIFICATION (UCG)

**NLC is pursuing a UCG Project under Coal
S&T for pilot study**

Project funded by Coal S&T, NLC and GOI

- 1. A project titled “Underground Coal Gasification” (UCG) and its utilization for power generation studies in lignite deposits in Rajasthan” is proposed to be undertaken by Neyveli Lignite Corporation Limited in association with internationally reputed UCG expert agency.**
- 2. Raneri lignite block, Bikaner, Rajasthan having reserve of 34 MT with depth of lignite occurrence at 75 to 115m as mostly single seam of about 3.6m average thickness and limited ground water has been selected for UCG Pilot project and further details are as below:**

ABOUT RANERI

LOCATION	The Block is situated about 80 Kms SW of Bikaner, Rajasthan along the NH No.15, covered in Survey of India Topo Sheet No. 45 A/10
OVERBURDEN	Overburden consists of wind blown sand, Kanker, variegated clays, fuller's earth, friable sandstone, shale, generally ranges from 75 to 115 mts. Average thickness is 97 metres.
LIGNITE	Lignite generally occurs as single seam, thickness ranges from 0.42 to 14 metres. Average thickness is 3.59 metres.
LIGNITE QUALITY	Moisture: 45 %, Ash : 7.2 %, VM : 25.58%, FC : 22.11%,CV : 3092 K.Cal/kg.
LIGNITE RESERVES	Geological : 33.92 MT, Within 1:15 - 4.61 MT, Within 1:10 - 2.54 MT
Roof & Floor Strata	Mostly clays
Other details	Water level 90 to 110 metre bgl, water is Potable Detailed hydro-geological studies required.

UNDER GROUND COAL GASIFICATION PILOT PROJECT

It is proposed to have an integrated UCG pilot project with minimum of 25 MW Integrated Gas Combined Cycle (IGCC) power plant.

Assistance/Consultancy and budget estimate for the above integrated pilot project required from USA to implement the project.

Agenda V – Comments on Alternate Mining Technology (Other than SME) for Mine-III

STATUS:

An agreement between the Govt. of USA, acting through USTDA and NLC was signed on 13.03.2006 for the Grant value of US \$ 360,000 for the Technical Assistance for preparation of Feasibility study on Alternate Technology for Mine-III. M/s. Norwest Corporation, Utah was awarded the contract for preparation of Feasibility study on Alternate Mining Technology for Mine-III.

MINE-III

- ❖ **M/s. Norwest Corporation has submitted the report in September, 2007 and recommended to compare economics of the CME Technology with the SME Technology presently used in Mine-I & Mine-II to determine the most favourable between the two technologies.**
- ❖ **The Cost of production of lignite deploying SME system may become cheaper than deploying CME equipments due to increase of depreciation period from 8 years to 15 years. Moreover, the time schedule for supply of SME and CME is same. NLC is presently working on this to review the economics of two technologies.**

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MINE-III

Besides, the following are the constraints for implementation of CME technology:

- ❖ M/s Norwest has suggested 60 M3 shovel with 220T dumpers. Outsourcing agencies for these higher capacity equipments may not be available in the market. Availability of spares in time is another serious issue.**
- ❖ The Shovel-Dumper option requires significant quantities of competent crushed aggregates to surface the haul roads and requires special attention. (25m wide & about 14 to 17.5 km length per Annum costing about 5 to 18 million \$)**
- ❖ Operation of CME equipments during monsoon period in Tertiary formation will pose difficulties thereby reducing the availability and productivity. Similar difficulties are experienced by Vastan Lignite Mine in Gujarat, where the Mine operations are stopped during monsoon period.**
- ❖ Higher size Shovels i.e. 60 M3 need erection time more than 36 months.**

CONCLUSION

- 1. For the agenda points I to IV mentioned above, the response is awaited from US side.**
- 2. For point No.V, M/s. Norwest Corporation has submitted the final report and recommended to compare economics of the CME Technology with the SME Technology.**
- 3. The Cost of production of lignite deploying SME system may become cheaper than deploying CME equipments due to increase of depreciation period from 8 years to 15 years and is being reviewed by NLC.**

Thank You