

PRE FEASIBILITY REPORT – NLC TALABIRA TPP, STAGE-I (3X800 MW)

1.00.00 Introduction and Background

Electricity is a basic human need and essential requirement for all facet of our life. Power development is one of the key infrastructure elements for the socio-economic growth of the country. The entire Indian Economy hinges on the availability of reliable and quality power at competitive rates to rural India for its overall growth and to Indian Industry to make it globally competitive.

The power sector is in a crucial juncture today. With the implementation of large capacity addition through solar plants, the sector has started showing signs of shift from “regulated & protected” to a market driven environment of business. The thermal power stations are having the responsibility to comply with more stringent environment norms for sustainable development.

NLC India Limited (a Navratna CPSU under Ministry of Coal) is engaged in mining and power generation since its inception and has contributed to the social and economic development of the country for over 5 decades. NLCIL has the advantage of vast expertise in both mining and power sectors giving it a unique position for setting up of cost effective power projects.

NLCIL is having lignite mining capacity of 28.5 MTPA (through Mine-I, Mine-IA & Mine-II) with power generation capacity of 2990 MW at Neyveli at present. NLCIL is also having lignite mining operations at Barsingsar (Bikaner, Rajasthan) associated with 250 MW power generation units. NLCIL is also owning and operating a 2X500 MW coal based station at Tuticorin in Joint Venture with Tamil Nadu. In addition, Neyveli New Thermal Power Project (2x500 MW) at Neyveli (as replacement units for aging 50 MW & 100 MW units of 600 MW capacity TPS-I) and another 3X660 MW project at Ghatampur, U.P. in joint venture with U.P. are under execution.

Ministry of Coal, Govt. of India vide Order no. 103/I/ 2016-NA dated 02.05.2016 have allotted Talabira-II & III captive coal mining blocks in Odisha to NLCIL. The rated capacity of Talabira-II & III mines is 20 MTPA. Talabira mines were initially envisaged to supply coal to proposed 4000 MW Sirkali project in Tamil Nadu. Now, Sirkali project is not being pursued further due to various reasons (especially the higher project cost due to higher landed coal cost etc.).

Accordingly, NLCIL Board on 12.09.16 accorded in-principle approval for putting up 2000 MW TPP in the proximity of Talabira-II & III coal blocks..

Accordingly, a site near Kumbhari & Taraikela villages in Jharsuguda Distt. linked to Talabira-II & III captive coal mining blocks was identified and applications were uploaded on Investment Promotion and Infrastructure Corporation of Odisha

Limited (IPICOL) portal on 27.10.16 & 30.01.17 for accord of GOO's approval for availability of land and water for 2x800 MW plus 2x800 MW TPP respectively.

IPICOL vide letter dated 10.07.2017 (copy placed at **Annexure-I**) forwarded approval of HLCA communicating GOO's in-principle approval for the 3200 MW capacity project. As per approval, 14% generated power need to be supplied to Odisha at variable cost basis.

NLCIL is now planning to implement 3200 MW Talabira TPP in 2 Stages (Stage-I - 3x800 MW and Stage-II – 1x800 MW at a later date)

The present proposal is for implementation of 3x800 MW coal based super critical units.

2.00.00 Site Selection/ Feasibility Studies

2.01.00 Three alternative sites were visited by the site selection team of NLCIL comprising of members from Power Station Engg., Talabira project site official at Sambalpur, Regional office, Bhubaneswar and Advisor (Power) from New Delhi supported by local revenue officials in August, 2016 and Nov.2016. The location of alternative sites on a map is placed at **Annexure-II**. The salient details of alternative sites are briefly elaborated below:

Site-I near Babuchakli, Baunsen and Jharmunda villages in Rengali Tehsil

The site is located near Babuchakli, Baunsen and Jharmunda villages in Rengali Tehsil at a distance of about 6 kms. South of Rengali town on Sambalpur – Jharsuguda State highway (now declared as NH). About 2500 acres of land comprising of about 800 acres barren/ single crop agriculture land, about 1200 acres Govt. barren land and about 500 acres forest land was earlier identified in 2004-06 by NLC for development of 2000 MW capacity power project linked to Talabira -II & III mine blocks. The site is located close to water spread of Hirakud reservoir. State Govt. was also requested for land availability confirmation. However, the matter was not pursued further by NLCIL due to various reasons. The likely water drawal point in Hirakud reservoir is at a distance of about 1.5 kms. The Talabira – II & II mine blocks are at a distance of about 15 kms. (a bridge is needed to cross the water spread of Hirakud reservoir). There is no land in possession of NLCIL

During site visit, it was observed that lot of social forest have been developed at the Govt land and 2/ 3 crops are being taken in the agriculture field in scattered way with the help of tube wells within the project site. The net available area after leaving the above is of the order of about 500 acres.

Site-II near Hadumunda, Tolibahal and Bamloi villages in Rengali Tehsil

The site is located near Hadumunda, Tolibahal and Bamloi villages in Rengali Tehsil at a distance of about 4 kms. North of Rengali town on Sambalpur – Jharsuguda State highway (now declared as NH). The project site area of about 1500 acres was

selected on the Survey of India Toposheet clearing the reserve forest area and habitation for further examination. The water source (Hirakud reservoir is at a distance of about 15 kms from the identified site. Talabira – II & II mine blocks are at a distance of about 15 kms. (a bridge is needed to cross the Bedhan river and ROB is needed for crossing the highway. There is no land in possession of NLCIL.

During site visit, it was observed that many large scale industries lot of habitation has come up in the vicinity of the project site. Large extent of the identified land has been acquired by the industries for development of colonies and many private dwelling units have also come up there.

Site-III near village Kumbhari and Taraikela villages in Jharsuguda

About 1200 acres of the identified near Kumbhari & Taraikela villages for power plant, water reservoir & integrated township at a distance of approx. 12 kms. South West of Brijraj Nagar in Jharsuguda District. and about 500 acres of land near Thekolai village has been identified for Ash Disposal area in Sambalpur. The plant area is located below the Southern boundary of SMC Power Plant and surrounded on three sides by Bedhan river. The entire land is barren/ single crop (rain fed) agricultural land and is not likely to pose problem in acquisition. The Talabira -II & III mine blocks are across the river Bedhan at a distance of about 2 kms and hence the pipe conveyor could be provided for coal transportation to the power plant. Water reservoir could be developed in low lying area on the southern side (surrounded by river on three sides) in about 160 acres and ash could be transported to disposal area located across river (about 2 kms.) through HCSD system.

There is no land in possession of NLC. Further, it will require 2 nos. bridges on Bedhan river for coal transportation from Talabira mines & ash disposal pipelines.

2.02.00 Analysis of Alternative Sites

Amongst the above cited alternatives, Site-III near village Kumbhari and Taraikela villages has been considered as optimal project site.

Site-I near Babuchakli, Baunsen and Jharmunda villages in Rengali Tehsil is not considered suitable since sufficient land for development of large capacity project is not available and coal source is also at a longer distance.

Site-II near Hadumunda, Tolibahal and Bamloi villages in Rengali Tehsil is not considered suitable since sufficient land for development of large capacity project is not available and coal source is also at a longer distance.

Site-III near village Kumbhari and Taraikela villages in Jharsuguda & Sambalpur Distts is considered suitable and selected for development of 3200 MW capacity coal based thermal power project based on the following considerations:

1. Availability of suitable & adequate land
2. Availability of reliable source of water (Hirakud reservoir) in close vicinity

3. Availability of road and railway access
4. Environmental aspects
5. Availability of infrastructural facilities
6. Conformity to Siting Criteria of MOEF

3.00.00 Project Highlights and Technical Features

As per the Ministry of Power's O.M. dated 13.11.2009, the capacity addition during 13th Plan (01.04.2017 to 31.03.2022) onwards will be through supercritical units only. In line with the guidelines of MOP, it is proposed to adopt Supercritical technology. The advantages of supercritical technology are listed below.

- Higher plant efficiency
- Less Fuel Consumption
- Less Infrastructure Investment for Fuel Transport / Storage and Ash Disposal
- Less Emission (CO₂, SO_x, NO_x, Dust/Ash)
- Less Auxiliary Power Consumption
- Less Water Consumption (No need of continuous blow down in case of once through boiler.)
- Lower operating costs
- Greater operating flexibility

Location

The plant and Township of the project are located near Kumbhari and Taraikela villages on south west of Brijraj Nagar town on Sambalpur Rourkela highway in Jharsuguda district and ash disposal area is located near Thelkolai village in Sambalpur district. The total land identified for the project is 1511 acres. The project site is approachable from Sambalpur – Jharsuguda highway after crossing Bedhan river bridge vis state PWD road. Two separate 4 lane roads from Sambalpur – Jharsuguda highway have been envisaged for main approach to the project site. The nearest airports are at Bhubaneswar at a distance of 350 kms. and Raipur airport is at a distance of approx. 290 KMs. Nearest railway station at Jharsuguda on Howrah-Nagpur main (trunk) section is at a distance of 11 kms. The Vicinity Plan of the project site indicating the Talabira plant area, ash disposal area, water reservoir, Township and Talabira mine is placed at **Annexure-III**.

Land Requirement

The project shall be accommodated in the identified 1511 acres of land comprising of Plant area – 661 acres, Green Belt 250 acres, Ash Disposal Area – 400 acres, Common T/ship – 100 acres and Corridors -100 acres. Proposal for acquisition to be submitted to IPICOL shortly. The Area Plan and General Layout Plan (GLP) are placed at **Annexure-IV** and **Annexure-V** respectively.

Additional land (approximately 60 acres) for make up water pipelines from Intake Pump House at Hirakud Reservoir up to plant shall be taken on right of way basis after finalization of its alignments.

Capacity : 3X800 MW - Present proposal

Mode of Operation : Base Load

COAL :

Coal from Talabira -II & III captive mines allotted to NLC India Limited

Annual Coal Requirement :

11 MTPA considering GCV of 3700 Kcal/kg, Station Heat Rate of 2163 kcal/kwhr and PLF of 85%.

Coal transportation :

From the linked coal mine located across Bedhan river through Pipe/ Belt Conveyor system. It is proposed that a separate chute shall be provided in the fast loading silo for meeting the power plant's requirement. Further conveyor system shall be in the scope of TPP. Exact location of Silo tap off & routing of the conveyor shall to be firmed up at a later date after finalization of MDO for Talabira mines.

Cooling Water Source, Requirement and Commitment

Consumptive water requirement for present stage of 2400 MW is 60 Cusec (80 cusecs for ultimate capacity). The water is proposed to be drawn from Hirakud reservoir at a distance of about 20 Kms. In-principle approval of State Govt. is available. However, water drawal point location, pipe routing and other terms need to be discussed & finalised with WRD. Additional water requirement for FGD plant would be 2 cusec/ unit i.e.6 cusec for all the three units. Thus the total consumptive water requirement shall be 66 cusecs (88 cusecs for all 4 units).

Makeup water from the source shall be pumped to an in-plant raw water reservoir having storage capacity of about 10-15 days to take care of emergencies. Presently, Induced Draft Cooling Towers (IDCT) have been proposed for the project. It is envisaged to adopt Cycle of Concentration in such a way to achieve zero discharge of plant's treated effluents to any water body outside the project area.

Steam Generator Technology

The Steam Generators (SG) shall be super-critical, once through type, water tube, direct pulverized lignite fired, top supported balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (tower type) or two pass type rated to deliver approx.. 2100 t/hr of superheated steam at 281 kg/cm²(a) & temp. of 603±5°C. The reheat steam temperature would be of 603±5°C.

The SG would be designed to handle and burn Heavy Fuel Oil (HFO) and Light Diesel Oil (LDO) as secondary fuel up to 30% SG MCR (maximum continuous

rating) capacity for flame stabilization during low-load operation. For unit light up and warm up purposes, light diesel oil (LDO) would be used with air atomization.

The steam generator unit will be provided with electrostatic precipitators. The ESP will have adequate number of ash hoppers provided with electric heaters. Microprocessor based ESP controller will be provided. The ESP will be designed to control particulate matters in flue gas to a maximum of 30 mg/Nm³.

Flue Gas De-sulpharization (FGD) shall be implemented as a separate turnkey EPC package and Selective Catalytic Reduction (SCR) system shall be included in the scope of Steam Generators (SG) supplier to meet the latest notification of MoEF in respect of Sox and NOx emissions.

Steam Turbine Technology

The steam turbine shall be tandem compound, single reheat, regenerative, condensing, multi cylinder design with separate HP, separate IP and separate LP casing(s) OR combined HP-IP and separate LP casing(s), directly coupled with generator suitable for indoor installation.

Turbine shall be capable of operating continuously with valves wide open (VWO) to swallow 105% of EMCR steam flow to the turbine at rated main steam and reheat steam parameters. The steam turbine generator shall also be capable of delivering at generator terminals at least 105% of rated output (Guaranteed Output) without any constraints with all the valve wide open, rated steam condition and condenser pressure as optimized by TG supplier targeting lowest heat rate with 0% makeup.

Coal Handling Plant CHP System

External Coal Handling System shall comprise of two (2) identical & parallel streams of 2000 to 3000 TPH rated capacity each to deliver coal from Talabira mines to the power plant site. Keeping in view the crossing of Bedhan river, Pipe Conveyor System may be envisaged for coal transportation from mine to Crusher House in the plant area. The raw coal stock shall be maintained at the mine end across Bedhan river and after crushing coal can be directly fed to power plant bunkers or diverted to the crushed lignite stockyard. 2 nos. Stacker cum Reclaimers shall be provided at the crushed coal stock yard for stacking and reclaiming the crushed coal.

Internal Coal Handling System (ILHS) consisting of two (2) identical & parallel streams to operate at rated capacity of 2000 to 3000 TPH each to cater to the fuel requirements of 3X800MW Units.

Beneficiary States

The present capacity of the project shall be 2400 MW (3x800 MW) with space provision for addition of one more 800 MW unit. The generated power shall be supplied to NALCO (1200 MW) and from the balance up to 14% to Odisha (on variable cost basis) & up to 1000 MW to Tamil Nadu, Puducherry and Kerala. A

MOU in this regard had already been signed with NALCO and comfort letters are also available from Discoms of Tamil Nadu, Puducherry and Kerala.

Project Implementation Schedule

Commercial Operation Date (COD) of the first 800 MW units is envisaged in 52 months from the zero date and second & third units at an interval of 6 months thereafter. The zero date shall be reckoned as the date of main plant award.

Associated Transmission System (ATS) clearance:

The power generated from the project will be evacuated through 400 KV transmission lines up to the nearest 400 kV Pooling Substation of Central Transmission Utility i.e. Power Grid Corporation of India Limited (PGCIL). Unit start-up power requirements shall be met by back charging of one of 400 kV transmission line. The present provisions for power evacuation are tentative and shall be reviewed based on the finalized ATS of the project by PGCIL. Commitment from PGCIL shall be obtained for the necessary infrastructure for power evacuation from the proposed generating station, by erecting transmission lines as deemed fit and necessary.

Project Financing

The overall debt-equity ratio proposed is 70:30. Equity will be financed through internal resources and the debt portion is proposed to be financed from Domestic Financial Institutions (FIs) and Banks.

4.00.00 Indicative Project Capital Cost and Cost of Energy

The indicative project capital cost and levellised tariff of the proposed 3x800 MW project considering 14% power to Odisha at variable cost (in line with HLCA's approval), landed coal cost of Rs. 716/tonne and GCV as 3700 Kcal/kg shall be as under:

Project Cost (Current)(incl. IDC & WCM in Rs. Crore)	Cost / MW (Rs. Crore/ MW)	Levellised Tariff at Busbar of TPP (Rs./ kwhr)		
		Fixed Charges (Rs./ kwhr)	Variable Charges (Rs./ kwhr)	Total
16073.86	6.70	2.31	0.55	2.86

NLCIL being a Central Govt. PSU, the tariff for the power generated from its plants are fixed by CERC as per CERC's tariff notifications, wherein no provision is there to supply power to home state on variable cost. Accordingly, the matter has already been taken up with Govt. of Odisha to waive off requirement of 14% power at variable cost.

The indicative project capital cost and levellised tariff of the proposed 3x800 MW project without considering 14% power to Odisha at variable cost and landed coal cost of Rs. 716/tonne @ GCV as 3700 Kcal/kg shall be as under:

Project Cost (Current)(incl. IDC & WCM in Rs. Crore)	Cost / MW (Rs. Crore/ MW)	Levellised Tariff at Busbar of TPP (Rs./ kwhr)		
		Fixed Charges (Rs./ kwhr)	Variable Charges (Rs./ kwhr)	Total
16073.86	6.70	1.98	0.55	2.53

The above estimated cost is of the order cost without any detailed estimation of bill of quantities for the purpose of Pre-Feasibility Report only. However, the detailed cost estimates and financial analysis will be carried out during Detailed Project Feasibility Report stage based on the site specific data.

5.00 Conclusion

On analysis of all aspect involved for the development of the project, it is concluded that:

“It is technically feasible to establish 3x800 MW units (with expansion provision of additional one unit of 800 MW) based on Super-critical Technology at the site identified for the project considering the availability of infrastructural facilities subject to tying up of basic inputs and obtaining the statutory & non statutory clearance of the concerned authorities.”

6.00.00 Environmental aspect

A Draft Environmental Impact Assessment report for this project will be prepared based on the TOR prescribed by MOEF. Tamil Nadu State Pollution Control Board will then be approached for conducting Public Consultation. Thereafter, the EIA report will be finalized incorporating public hearing minutes & action plan for its submission to Ministry of Environment & Forests (MOEF) for obtaining Environmental Clearance (EC), in accordance with the procedure laid down in the MOEF Notification dated 14th September’ 2006 and its further amendment dated 01st December’ 2009. All relevant notifications in respect of environmental protection measures/ guidelines shall be fully complied.

Air pollution control system

High efficiency electrostatic precipitators (ESPs) will be installed to limit the particulate emission to 30 mg/Nm³ to facilitate wider dispersion of particulate and gaseous pollutants. A twin flue chimney of 275m height will be provided for wider dispersion of pollutants. On-line equipment will be provided for monitoring of stack emissions.

To control NO_x emission, supercritical boilers having advanced low NO_x generation system will be installed. In addition, Selective Catalytic Reduction (SCR) system will be installed to limit the NO_x emission as per latest environmental guidelines.

FGD system will be installed in flue gas duct to the chimney as per latest environmental stipulation. The design and layout of steam generator and its auxiliaries will take into account wet Flue Gas Desulphurization (FGD) system to be installed taking suction from duct after ID fan and feeding the desulphurised flue gases back to the chimney with provision for bypassing the FGD system.

For control of fugitive dust emissions within and around coal handling plant, dust extraction/ suppression systems would be provided. Dust suppression system shall also be provided in the coal stock yard.

Noise Pollution Control Systems

The major noise generating sources in a thermal power plant are the turbines, turbo-generators, compressors, pumps, fans, coal handling plant etc. from where noise is continuously generated. Acoustic enclosures shall be provided wherever required to control the noise level below 90 dB (A). Wherever required, the workers shall be provided with protective equipment such as ear plugs and ear muffs.

Solid Waste Management Systems

Ash will be the major solid waste generated from the power project. An ash management scheme shall be implemented consisting of dry collection of ash, supply of ash to entrepreneurs for utilization and promoting ash utilization to maximum extent and safe disposal of unused ash.

Water Pollution Control System

An effluent management scheme, consisting of collection, treatment, recirculation and disposal of effluents shall be implemented in order to optimize the make up water requirement as well as liquid effluent generation.

The liquid effluents shall be collected and treated/ recycled as per the following design philosophy:

- The filter backwash water of PT plant shall be collected and recycled back to the inlet of clarifiers.
- The sludge from clarifiers of water PT Plant shall be collected in a sump/ pit and shall be pumped to bottom ash slurry sump for disposal to ash dyke.
- The waste effluents from neutralization pits of DM plant and condensate polishing plant shall be collected in the respective neutralization pits and neutralized before pumping to the central monitoring basin before final disposal
- Re- circulating type cooling water (C.W) system with cooling towers, with C.W. blow down from cold water side to ensure no thermal pollution. Part of CW system blow down would be used for service water system, fly ash handling and coal dust suppression. The unused blow down shall be led to central monitoring basin after treating through clarifiers/ tube settlers. The

sludge from clarifiers/ tube settlers shall be disposed off in bottom ash dyke along with bottom ash slurry.

- coal particle settling pond shall be provided to remove coal particles from coal handling plant waste. Decanted water shall be pumped back to the coal dust suppression system
- Service water effluent collected from plant drains shall be led to a sump from where it shall be pumped into the clarifiers/ tube settlers for treatment of suspended solids. Treated service water shall be sent back to the service water tank to the extent possible for re- use.
- All the plant liquid effluents shall be mixed in the central Monitoring basin (CMB) and disposed off to the final disposal point.

An independent plant effluent drainage system would be constructed to ensure that plant effluents do not mix with storm water drainage. Efficient operation of various treatment schemes shall be ensured so that the quality of treated effluent from CMB conforms to relevant standards, prescribes by regulatory agencies.

The sewage from plant and township shall be treated in a sewage treatment plant. The treated sewage conforming to prescribed standards shall be utilized for plantation to the extent possible.

Description of the Environment

In order to identify the environmental impacts due to the construction and operation the project and associated facilities, an EIA study is proposed to be undertaken to establish baseline environmental status for various environmental attributes within the study area. The major environmental disciplines to be covered in the EIA report includes ambient air quality, water quality, noise, soil, ecology (terrestrial and aquatic), land use, geology, hydrology and demographic & socio-economic conditions.