1.0 Introduction

NTPC Limited is the largest thermal power generating company of India. It was incorporated in the year 1975 as a public sector company to accelerate power development in the country as a wholly owned company of the Government of India. This year Government of India awarded it Maharatna Status.

In pursuit to achieve its target to eliminate energy and peaking shortages in the country, NTPC Ltd proposes to set up Lara Integrated Super Thermal Power project (Lara STPP)in two stages stage-I (2x800 MW) and Stage-II (3x800 MW). Present proposal is for stage-I (2x800 MW). The Lara Super Thermal Power Project Stage-I (2x800 MW) is a bulk tendering project of NTPC.

1.1 Site and Surroundings

The plant site is located south-east of Raigarh town, of Chhatisgarh, having latitude and longitude of 21°44' 48" N and 83° 26' 00"E respectively. Near by villages are Chhapora, Lara and Lohakhan. Further, project site is located at a distance of about 30 kms from Raigarh railway station of South Eastern Central Railway.

The Terms of Reference (TOR) for EIA report was accorded by MOEF Vide Letter dated 01/08/2007 for carrying out the EIA study.

The Environmental Impact Assessment (EIA) study is awarded to M/S Mantec Pvt. Limited, Delhi. The baseline data were generated for a period of one year. The draft EIA is prepared based on 12 months data that is from Dec 2006 to Nov 2007.

1.2 Land Requirement

The Lara STPP stage–I (2x800) MW of the project will require approx. 2375 acres of land whereas 525 acres will be require for ash dyke of Stage-II. Based on actual Khasara details, application for acquisition of 2858 acres (1156.466 ha) submitted to State Government for both stages. The land comprises of private agricultural land, Govt. land & Govt. forest land (Chote Jhar Ka Jungle). The proposed project would provide employment to a large number of personnel. The project also generates direct and indirect employment to a considerable number of personnel who will render there services to the project.

1.3 Water Availability and Requirement

The make up water for the plant is proposed to be drawn from River Mahanadi. The estimated requirement of make up water for the Lara STPP Stage-I (2x800 MW) capacity would be 5290 m^3/hr. Chhattisgarh Government has approved the reservation of 50 cusec (45 MCM) water for the project from Mahanadi River vide letter dated 17.01.2011.

1.4 Fuel Availability & Requirement

Coal requirement for Lara-I, STPP project is estimated as 7.00 million tonne/annum, considering average GCV of 4200 kcal/kg and 90 % PLF shall be met from Talaipalli coal blocks (Mand-Raigarh coalfields) allotted to NTPC.
Coal is proposed to be transported from Coalfields through MGR/Indian Railways network. The coal quality considered in EIA is as follows:

Ash	34-37
GCV (kcal/kg)	4200(Average)
Sulphur(Max)	0.3-0.5%

1.5 Transmission System

The power generated will be evacuated through a transmission system to be evolved and implemented by Power Grid Corporation of India Ltd.

1.6 Project Description

NTPC Ltd proposes Lara Super Thermal Power Project, Stage–I 2X800 MW, which is intended for faster implementation of power and other infrastructure projects in the Country. The estimated cost of the project is Rs. 11741.72 crores, which includes Rs. 787 crores for environmental protection measures.

TABLE-1.1
SALIENT FEATURES OF PROPOSED POWER PLANT

Sr. No.	Features	Details of Power Plant
1	Capacity	1600MW
2	Configuration	2 x 800 MW
3	Type of boilers and technology	Pulverized Coal and Super Critical
4	Power evacuation	Power generated at NTPC Ltd will be evacuated at switchyard of 400 kV
5	Fuel	Coal
6	Source of Coal	From Tallipali Coal block of NTPC
7	Coal Requirement	7.00 Million Tonnes Per Annum (MTPA)
8	Sulphur content	0.3-0.5%
9	Ash Content in Coal	34% - 37%
10	Ash generation	3.0 Million Tonnes Per Annum (MTPA)
11	Bottom Ash	0.6 Million Tonnes Per Annum (MTPA)
12	Fly Ash	2.4 Million Tonnes Per Annum (MTPA)
13	ESP efficiency	99.9%
14	Stack	One bi-Flue stack of 275 m height
15	Water Requirement for makeup	50 Cusecs

Source*: Project Report*

2.0 Description of the Environment

• *Location and Description of the Site*

The terrain of the land in the plant site is plain with gentle slopes and Mahanadi and Kelo River are present in the site area. The environmental setting of the proposed plant site is given in **Table-10.2**. The study area map of 10 km radius is also given in **Figure-1.1.**

TABLE-2.1
ENVIRONMENTAL SETTING OF THE SITE

Sr. No.	Particulars	Details
1	Project Location	South-east of Raigarh town in Chhattisgarh State
2	Plant Site Latitude	Latitude: 21^{o} 44' 48" N
3	Plant site Longitude	Longitude: 83^{o} 26' 00" E
4	Elevation	235m above MSL
5	Present land use at the site	Govt. Barren land, Govt. revnue land (Chote Jhar Ka Jungle) and Single crop Agricultural Land
6	Nearby Villages	Chhopara, Riyapalli, Lohakhan, Nayakpara, Lara
7	Nearest highway	NH 200
8	Nearest railway station	Raigarh, (30 km)
9	Nearest airport	Raipur (250km)
10	Nearest town/City	Raigarh (30 km)
11	Hills/valleys	None in 10 km radius
12	Meteorological conditions : Annual (IMD, Raigarh)	Annual Maximum Temperate: 42.6°C Annual Minimum Temperature: 13.2°C Annual total rainfall: 1602 mm Wind direction: NE, SW and NW
13	Climatic conditions : pre-monsoon season (IMD, Raigarh)	Maximum Temperature: 42.2^{o}C Minimum Temperature: 17.1 ^{o}C Wind direction: NW, W and ENE
14	Topography	Plain
15	Archaeologically important places	None within 10 km radius
16	Protected areas as per Wildlife Protection act,1972(Biospheres, Tiger reserves, Elephant reserves, National Parks / Wildlife Sanctuaries, Conservation reserves and Community reserves)	None within 10 km radius
17	Reserved / Protected Forest	Gajmar and Hargan Reserved Forests (8 km)
18	Seismicity	Seismic Zone-II according to IS:1893-

Sr. No.	Particulars	Details
		2002
19	Surface water bodies	Kelo River and Mahanadi River
20	Defence Installations	None within 10 km radius
21	Industrial areas	Small industries

3.0 Baseline Environmental Scenario

The baseline environmental status for various environmental attributes within the study area has been established through field monitoring supported by data from secondary sources. The environmental disciplines studied include land use, demography and socio-economics, geology, soils, hydrology, water use, water quality, meteorology air quality, terrestrial and aquatic ecology and noise.

3.1 Land Use

As per the Revenue Records of 2001 the area within the radius of 10 km from the proposed project site exhibited mixture of various land utilization activities. There is a 1.87% forest area within the study area. The irrigated and un-irrigated agricultural lands are 24.14% and 51.45%, respectively. The percentage of cultivable wasteland is 20.78% and other irrigated land is 1.76%.

3.2 Demography and Socio Economics

In the study area total population in 2001 was 66411. The males and females constitute about 50.11 % and 48.89 % respectively of the total population in the study area. The study area is predominantly rural in character. Census records show that about 14.56% of the population belonged to Scheduled Castes (SC) and 23.37% to Scheduled Tribes (ST). The study area experiences a considerably good literacy rate of 63.66 %.

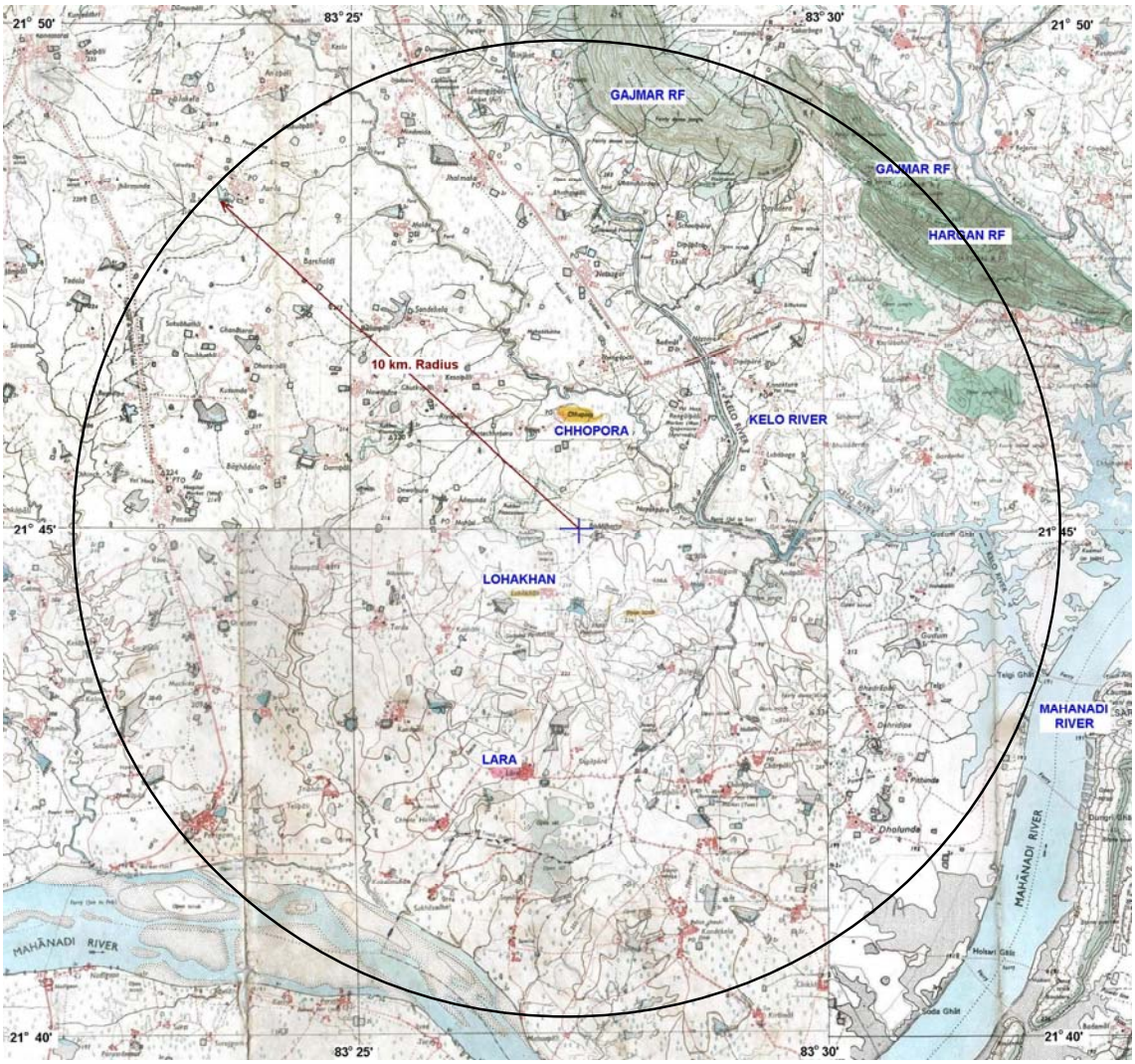

FIGURE-1.1
STUDY AREA MAP (10 KM RADIUS)

3.3 Soils

Soil samples were collected from 10 locations. The analysis of samples indicates that soils in the plant area are Sandy/loamy. The soils in general are neutral to slightly alkaline and fertile.

3.4 Hydrology

There are two natural surface water bodies i.e. Mahanadai River and Kello River within the 10 Km radius of study area. Mahanadi River is the major fresh source in the study area. The deep water levels are noticed in the areas of drainage divide and highly impermeable and massive shale, sandstone dolomite and limestone.

3.5 Water Quality

Surface and ground water quality within the study area was established through monthly monitoring of physico-chemical and bacteriological characteristics at six locations including two from the river Mahanadi, One from Kelo river and Three from other ground water sources like tube wells and dug wells. The analysis indicates that the surface water quality of the Mahanadi and Kelo river at all sampling locations, is fairly good.

3.6 Meteorology

The climate of the area is hot and humid. Winds are light to moderate strengths. The data collected during the study indicate that the site meteorology is similar to that of climatic data.

3.7 Ambient Air Quality

Ambient air quality was conducted at four appropriate locations within the study area to know the status of various air pollutants like Total Suspended Particulate Matter (TSPM), Respirable Particulate Matter (RPM), Sulphur Dioxide ($S0_2$), Oxides of Nitrogen (NOx). The results indicate that the concentrations of TSPM, RPM, $S0_2$ and NOx in the area are well within the National Ambient Air Quality Standards for residential area. The maximum values of each parameter are given **Table-10.3**.

TABLE-3.1
AMBIENT AIR QUALITY OF THE STUDY AREA

All concentrations are expressed on $\mu g/m^3$

Parameters			Standard
	Min.	Max.	
SPM	94	134	200*
RPM	38	65	100
SO_2	5	11	80
NOx	8	16	80

*Old NAAQS

3.8 Ecology

The study area consists of Gajmar & Hargan Reserved Forests. The study area is an intensively cultivated agricultural area and natural vegetation occurs in scattered patches mostly on vacant plots around agricultural fields and on wasteland. The Mahanadi river crosses south and kelo river to the North East of the study area makes the land fertile on its both the banks. The main crops are rice and Wheat. Sugarcane and Maize are grown in small patches. The fish fauna of Mahanadi river at Lara comprises both plain and hill river species with sizeable representation of carps and catfishes. No rare and endangered species of fauna and flora have been reported in the study area. There is no National park and wild life sanctuary within 25 km radius area.

3.9 Noise

Ambient noise levels were measured at ten locations around the project site. The equivalent noise levels vary between 36.9 to 53.0 dB(A) at all monitoring location. The $L._{day}$ varies from 38.1 to 54.2 dB(A). The Lnight varies from 33.6 to 48.8 dB(A). Noise levels are within the regulatory limits at all monitoring locations.

4.0 Environmental Impacts

4.1 Land Use

About 2375 acres of land is required for setting up of Lara STPP Stage-I whereas 525 acres would require for ash pond of stage-II. The land identified for the project comprises of private agricultural land yielding single crop, Govt. land and Govt. forest land (Chote Jhar ka Jungle). Existing land use will be changed in to industrial use. The construction activities attract a sizeable population and influx of population is likely to be associated with construction of temporary hutment for construction work force. However, this will be only a temporary change and shall be restricted to construction period.

Development activity also induces changes in land use pattern of the adjoining areas because of the increased availability of infrastructural facilities, increase in commercial value/ potential of land etc.

4.2 Water Use

Chhattisgarh Government has approved 45 MCM per annum water for NTPC from Saradih barrage on Mahanadi River for Stage-I (2x800 MW) of the project. No ground water will be extracted for operation of plant. Therefore, no impact on water use is envisaged.

4.3 Demography and Socio Economics

Migration of workforce to project site and increase in floating population may create strain on civic. amenities like road, transport, communication, drinking water, sanitation and other facilities to meet the work force requirement.

However, such impacts will be temporary and restricted to the period of construction only.

Commissioning of power plant will result in considerable growth of service sector and will also generate new industrial and business opportunities in the area.

Land acquisition will involve rehabilitation issue since private land is also involved. A detailed study of Project affected Persons will be undertaken to prepare a suitable R & R plan based on National R&R Policy, Chhattisgarh R&R Policy and NTPC Ltd R&R policy. The R&R Plan will be made and implemented in consultation with state govt.

4.4 Air Quality

Prediction of short term impacts on air quality due to stack emissions has been carried out using Industrial Source Complex [ISC3] 1993 simulation model, developed by United States Environmental Protection Agency [USEPA]. The model simulations deal with three major pollutants viz., Sulphur Dioxide (S02), Oxides of Nitrogen (NOx) and Suspended Particulate Matter (SPM) emitted from the stack.

The maximum predicted incremental ground level concentrations (GLCs) for SPM, SO_2 and NOx, due to operation of proposed project Stage-I are 135.47, 36.29 and 26.08 $\mu g/m^3$ respectively. The maximum GLCs for SO_2 and NOx after implementation of project are estimated to be within the ambient air quality standards for industrial and mixed use areas.

TABLE-4.1
MAXIMUM RESULTANT CONCENTRATION DUE TO OPERATION OF LARASTPP STAGE -I (2x800 MW)

Maximum AAQ Concentrations Recorded During EIA (in µg/m3)			Incremental Maximum Concentration due to stage project (in µg/m3)			Resultant Concentration (in µg/m3)		
SO_2	NOx	SPM	SO_2	NOx	SPM	SO_2	NOx	SPM
11.0	16	134	25.29	10.08	1.47	36.29	26.08	135.47

4.5 Soils

The impacts on soil during construction phase shall be mainly due to loss of topsoil in the construction areas and contamination of the soils of surrounding area due to construction materials such as cement, sand, oils, etc. However, it shall be temporary and shall be confined to the areas of construction only. Conservation measures would minimize such local impacts.

4.6 Water Quality

Flow of loose materials (soil and construction material) into the drain, especially during monsoons will result in higher turbidity and suspended solids. However, as the site development activities and construction activities will be limited to construction areas only, such impacts will be minimal. Adequate arrangement would be made to ensure proper drainage and disposal of the wastewater; so that water does not stagnate in the form of pools. The run off water will be directed to a sedimentation basin before discharge. Hence no increase in the suspended solid content of the water regime is expected.

High Concentration Slurry Disposal (HCSD) system for fly ash system and ash water recirculation system for the bottom ash shall reduce the quantity of effluent. Effluents from various sources after appropriate treatments will be led to Central Monitoring Basin (CMB) where regular check of its quality will be carried out. Treated effluents, meeting the limits specified for thermal power plants under Water Act and Environmental (Protection) Rules 1986, are proposed to be discharged from CMB.

The ash pond leachates are generally alkaline and, therefore, heavy metals are not likely to leach from the ash and, therefore contamination of ground water is unlikely. In bottom ash pond area also, a 30 cm. thick layer of HCSD shall be provided, which shall act as an impermeable layer.

4.7 Noise

The major sources of noise during the construction phase are vehicular traffic and construction equipment, which generate noise ranging between 75-90 dB(A). The predicted noise level due to the operation of the power plant at a distance of 2.0 km is 32 dB(A). As the ambient noise levels are higher than the predicted noise levels, due to the masking effects, no increase in the ambient noise level during the construction phase is envisaged.

The likely noise levels from the proposed project would be of the order of 90 dB(A). Due to the masking effect, the ambient noise level in the nearby villages will not increase during the operation of the plant. Hence, there would not be any adverse impact due to the operation of the plant on the residents in the nearby villages.

4.8 Terrestrial Ecology

During construction phase, deposition of fugitive dust on pubescent leaves of nearby vegetation may lead to temporary reduction of photosynthesis. Such impacts would, however, be confined mostly to the initial periods of the construction phase and would be minimized through water sprinkling. During operation phase, since the predicted ground level concentration of pollutant in ambient air is well within the Indian Standards for Ambient Air Quality. The Impact on the surrounding agricultural field and trees will be insignificant.

4.9 Aquatic Ecology

Larger organism tends to get entrapped and impinged in the intake system. However, this will be minimized by providing suitable structures at the intake location. Smaller organisms as phytoplankton, zooplankton is entrainable and subject to entrainment in the treatment system. The entrapped organisms would be subjected to a combination of physico-chemical and mechanical stresses, leading to their destruction. However, as clarified water shall be used in the plant systems, such impacts will be insignificant.

There would not be any tangible change in the water quality of the receiving water due to the wastewater discharges from the plant operation. As such, it may be concluded that no major adverse effects on the existing aquatic biota are envisaged due to the discharges from the project during operation.

4.10 Green Belt Development Plan

Provision of 100 meter width green belt around main plant area has been kept in the layout for green belt development. In addition, extensive plantation will be undertaken in and around the project site.

4.11 Potentiality of Ash Utilization

The main areas of ash utilisation are manufacturing of fly ash based products (portland·pozzolana cement, brick, light weight aggregates, asbestos cement products, cement concrete etc.) and use in land fills, structural fill etc. for development of land. NTPC Ltd will take all possible actions to utilize the ash in above mentioned areas. Provisions such as facilities for 100% extraction of dry fly ash, segregation of coarse and fine ash and fly ash storage and loading facilities; providing infrastructural facilities to the entrepreneurs, etc will encourage utilization of ash based products in the area.

5.0 Environmental Monitoring Programme

Post project environmental monitoring is important in terms of evaluating the performance of pollution control equipments installed in the project. The sampling and analysis of the environmental attributes will be as per the guidelines of CPCB/CGECB. Following attributes will be covered in the post project environmental monitoring in and around the project site:

- Ambient air quality monitoring on bi-weekly, 24 hours basis in the plant area and in the surrounding villages with respect to PM_{10}, $PM_{2.5}$, SO_2 and NOx
- Source emissions will be monitored on monthly basis. Automatic continuous online monitoring system shall be installed in the stacks;
- Water quality monitoring at intake point, surface water bodies and ground water in the surrounding villages. Further, the wells around the ash pond area will be identified and monitored on the monthly basis;

- Treated wastewater before routing to clarifier will be analyzed on fortnightly basis. The pH, temperature, electric conductivity, TDS and flow will be monitored regularly;

- The noise levels will be recorded in and around plant. The noise levels at boundary of the plant will be recorded on yearly basis;

- The soil quality around ash pond area will be monitored once in three years to check for the fertility of the soil;

- All the results will be compiled and thoroughly analyzed to assess the performance of the power plant; and

- The results will be reported on regular basis to the Chhattisgarh Environment Conservation Board and regional office of MoEF.

6.0 Environment Management Plan

During operation phase, the impacts on the various environmental attributes should be mitigated using appropriate pollution control equipment. The Environment Management Plan prepared for the proposed project aims at minimizing the pollution at source. A provision of Rs.787 Crores has been kept in Feasibility Report towards implementation of environmental protection measures for the proposed project.

7.0 Risk Assessment and Disaster Management Plan

The risk analysis for fuel storages such as LDO & HFO have been carried out. The possibility of any risks due to fire will be confined to the plant premises only. There will not be any community risks. Suitable disaster management plan has been prepared.

8.0 Project Benefits

The proposed project by NTPC Ltd would enable to meet part of the growing power demand due to rapid industrialization and also due to large scale use of electricity for irrigation, domestic and commercial purposes. Further, the proposed power plant will result in improvement of infrastructure as well upliftment of social structure in the area. It is anticipated that the proposed power plant will provide benefits for the locals in two phases i.e. during construction phase as well as during operational stage.

The major benefit due to the proposed project will be in the sphere of generating temporary employment for substantial number of personnel. The construction phase of power plant is expected to span over 51 months. Approximately 2000 persons would be required for the construction work, most of whom would be unskilled workers, although the power plant construction needs a large number of skilled personnel as well. These construction workers shall be taken from the

study area to the extent possible. Hence, the proposed project will benefit locals to some extent.

9.0 Conclusions

The proposed power plant has certain level of marginal impacts on the local environment. However, development of this project has certain beneficial impact/effects in terms of bridging the electrical power demand and supply gap and providing employment opportunities that will be created during the course of its setting up and as well as during the operational phase of the project.

In addition to the direct employment, there will be indirect employment of local people by utilizing their expertise in different areas like horticulture, site clearing (for power plant construction), etc. Also, due to secondary development in the study area, employment opportunities will be generated. About 1000 people are expected to get indirect employment.

The proposed power project will have marginal impacts on the local environment. However, with the implementation of the proposed pollution control and environment management measures, even the minor impacts anticipated due to construction and operation of the proposed power plant will be mitigated.