EXECUTIVE SUMMARY

Introduction

The Karnataka power Corporation Ltd (KPCL) signed an MoU with the Chhattisgarh government on Monday, September 8, 2008 for developing the proposed project in the Chhattisgarh state with an investment of Rs. 8,700 Crores. The proposed power plant would be developed in Janjgir district of Chhattisgarh State nearer to the coal mines of India's state-owned coal producer South eastern Coalfields Ltd.

Project Description

The salient features of the proposed project are furnished below:

Name of the Project	2x800 MW Thermal power project
Location of Project	
Village	Godhna
District & State	Janjgir, Chhattisgarh
Coordinates of the proposed plant site	21°47'07"N 82°33'45"E 21°49'03"N 82°36'04"E
Coordinates of Ash Pond Area	21°49'11.54"N 82°35'47.12"E
General Climatic Conditions	
Mean Maximum Temperature	45.9°C
Mean Minimum Temperature	9.0°C
Relative Humidity	Min 19%; max 88%
Annual Rainfall	1345.1 mm
Wind Pattern (during study period)	Northeast (NE)
Elevation	240 m MSL
Accessibility	
Road Connectivity	The plant site can be accessed by road connecting Bilaspur and Seorinarayan.
Rail Connectivity	The nearby railway station is Naila which is about 30 km from the site.
Airport	Raipur (200 km approximate)
Historical / Important Places	
Archaeological/Historically Important Site	None within 10 km distance from the proposed project site.
Water bodies	Mahanadi River
Forest Area	None within 10 km distance from the proposed project site.
Sanctuaries / National Parks	None within 15 km distance from the proposed project site.

Land Details of Proposed Plant

The land use break up of project area keeping in view of CEA guidelines is as follows:

Proposed Plant Land use	Land in acres
Plant Area	634
Ash disposal	136
Colony	44
Green belt	210
Miscellaneous facilities	216
Total	**1260**

Technical Details of the Proposed Power Plant:

Parameter	Description
Capacity of the Project	2x800 MW
Source of fuel	KPCL has applied for long term coal linkage to ministry of coal.
Fuel requirement	8.563 million tonnes per annum for the 2x800 MW units considering 85% plant load factor (PLF)
Calorific value	3,200 kCal/Kg
Heat rate	2300 Kcal/Kwh
Average ash content in coal (%)	45% (maximum)
Maximum Sulphur content in coal	< 0.5%
Water Requirement	141076 m^3/day
Source	Mahanadi River
Water transportation	The plant raw water for the project will be sourced from Mahanadi River through suitable intake structure & pumping system.
In plant storage	The raw water will be stored in raw water reservoir in the power plant area for subsequent use.
Raw water treatment	Water will be treated in Clarifiers, filters and in DM plant
Cooling water system	The cooling water system will comprise of natural draft cooling tower, circulating water pumps and cooling water piping.
Auxiliary fuel	LDO : 3000 KL per annum (PLF85%) HFO : 12,000 KL per annum (PLF85%)

Employment Details

	Company Employees	Contractor Employees	Total
During Construction	145	1200	1345
During Operation	800	-	800

Description of the Environment

Environmental Study was carried out during Post-monsoon 2009. The findings of the study are illustrated briefly in the following pages.

Air Environment

Ten locations were monitored for studying baseline ambient air quality. The location of monitoring stations and 98th percentile values are given in the following table.

98th Percentile Values (µg/m^3)

Location	SPM	RPM	SO_2	NO_X
Plant site	142.5	45.2	10.4	16.0
Godhna	142.4	45.5	8.9	12.9
Kukuda	124.7	40.8	10.0	10.0
Kuriydri	134.7	54.4	10.1	15.2
Rasaponri	131.5	50.2	9.6	13.9
Gidha	115.5	40.6	7.7	11.0
Kachanda	127.0	39.9	9.4	12.8
Salkhan	128.1	40.4	9.9	13.0
Tendua	115.2	36.7	8.7	13.2
Borada	127.1	40.7	8.9	13.7

The obtained values were well within the NAAQ Standards.

Noise Environment

Ten locations were monitored for studying baseline ambient noise levels. The locations and values obtained are given in following table.

Location Code	Location Name
N1	Plant Site
N2	Godhna
N3	Kukuda
N4	Kuriydri
N5	Rasaporni
N6	Gidha
N7	Kachanda
N8	Salkhan
N9	Tendua
N10	Borada

Noise Levels dB (A)

	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10
Min	38.5	38.9	36.6	39.2	39.6	39.5	38.9	39.1	38.9	36.7
Max	55.0	55.5	51.3	51.8	51.5	51.5	51.0	51.0	51.2	51.6
Ld	49.1	49.4	47.2	47.9	47.5	47.3	47.3	47.7	47.7	47.7
Ln	41.4	41.4	40.2	49.6	41.5	41.5	41.7	42.1	42.4	42.7

Water Environment

A total of 11 water samples were collected; out this 10 samples are from ground water sources and 1 sample from surface water.

The water samples were analyzed as per Standard Methods for analysis of water and wastewater, American Public Health Association (APHA) Publication.

The findings are as follows:

- pH of the samples varies between 6.34 – 8.08
- The concentration of Total dissolved solids varied between –196 -1000 mg/l
- Total Hardness is in the range of 180 - 339 mg/l
- Iron values are in the range of 0.1 mg/l
- Heavy metal concentration in all the samples was found to be below the detectable limits

Soil Quality

- The texture of the soil is sandy clay loam
- The pH of the soil in the study area is in the range of 6.33 – 8.06
- The electrical conductivity for the soil samples is in the range of 100-590 μ mhos
- It was observed that calcium and magnesium are in the range of 960-2680 ppm & 146 - 462 ppm. Sodium and potash in the soils vary from 60-131 ppm and 326-1158 kg/ha respectively

Biological Environment

Natural flora and fauna are important features of any natural environment. They are organized into communities with mutual dependencies among their members and show various responses and sensitivities to outside influences. .An ecological survey of the study area was conducted particularly with reference to listing of flora and fauna. Assessment of floral and faunal species was carried out by collating the field results with the available information and the data authenticated by the Forest Department, Chhattisgarh.

Socio-economic Environment

The study area has 43 villages with a population of **93903**. SC population of **21881** of the total population . The literate is **49813** in the project area.

The area is marked with reasonable good literacy rate with basic facilities for education, health, roads, transportation and communication etc.

Anticipated Environmental Impacts & Mitigation Measures

Air Environment

Major sources of air pollution are boilers of power plant, crushers and stockpiles. Fugitive Dust Emissions are also inevitable from Raw Material Handling System and the packaging and transportation sections.

The ground level concentrations are estimated due to the emissions from the proposed project, EPA approved Industrial Source Complex AERMOD View Model has been employed.

The predicted maximum GLCs for particulate matter are 4.26 $\mu g/m^3$

The predicted maximum GLCs for Sulphur dioxide are 64.31 $\mu g/m^3$

The predicted maximum GLCs for Oxides of Nitrogen are 57.32 $\mu g/m^3$

Mitigative Measures

- Suitably designed ESP with efficiency of not less than 99.9% will be placed downstream of the stacks which will separate out the incoming dust in flue gas and limit the dust concentration at its designed outlet concentration to less than 50 mg/Nm^3
- For the effective dispersion of the pollutants stack height has been proposed based on the CPCB requirements. The height of the stack will be 275 m and is of single chimney
- Dust suppression system by water sprinkler at dump hopper of coal
- Control of fugitive emissions from the ash pond through maintaining a permanent blanket of water cover over the deposited ash
- Green belt development and afforestation in the plant and surroundings of ash disposal area

Noise Environment

The major noise generating activities in the plant site are fans, blowers, compressors, pumps & motors etc.

Mitigative Measures

To achieve the noise limitations around the equipment, the main measures taken shall be as flows:

- Provision of Acoustic enclosures
- Small units like condensate and vacuum pumps, shall be designed so as to limit noise emission,
- Provision of silencers
- Noise generating items such as fans, blowers, compressors, pumps, motors etc. are so specified as to limit their speeds and reduce noise levels

Water Environment

The major impact on ground/surface water quality is insignificant because all the wastewater generated from the proposed power plant will be treated in comprehensive treatment plant and reused for ash management, dust suppression and green belt development.

Mitigative Measures

The total water requirement to the proposed unit is around 141076 m^3/day

About total 24986m^3/day of wastewater will be generated from the proposed power plant, which includes Boiler Blow down, DM clarifier wastewater, Main clarifier wastewater, Sludge, backwash and Sewage water.

Solid waste Management

Solid wastes that will be generated during the Operation phase mainly are fly ash and bottom ash. The total ash expected to generate from proposed power unit will be about 12420 T/day. Fly Ash quantity would be 9936 T/d and bottom ash would be 2484 T/d. Fly ash will be collected in dry form and stored in the silos and will be issued for production of construction material like cement, bricks, hollow/solid blocks, pavers blocks etc. Bottom ash will be pumped in wet form to the existing ash pond. However, the usage of bottom ash for road works will be encouraged. The Sludge generated in ETP / Sludge pit is around 47 TPD.

Environmental Monitoring Program

Environment Management Cell will handle the environmental management system in the unit. The environmental management cell will be headed by Head of Safety (Safety,

Health & Environment). HOS will be responsible to HOD (Technical Services). The HOS will be assisted by officers to look after the safety and environmental factors round the clock.

Monitoring Program

The Environment Management Cell is the nodal agency to co-ordinate and to provide necessary services on environmental issues during operation of the project. This environmental cell is responsible for implementation of environmental management plan, interaction with the environmental regulatory agencies, reviewing draft policy and planning. This cell interacts with Karnataka State Pollution Control Board (KSPCB) and other environment regulatory agencies. The cell also interacts with local people to understand their problems and to formulate appropriate community development plan.

Environmental Laboratory Equipment

The industry will provide an in-house environmental laboratory for the routine monitoring of air, water, noise, and soil quality. For all non-routine analysis, the plant may utilize the services of external laboratories and facilities.

Monitoring System:

Online stack monitoring system will be installed in the plant premises. Ambient monitoring stations will be suitably located, preferably in the vicinity of Boiler, Steam Generator, Steam turbine, Coal stockyard, and Ash disposal area.

- The equipment / instruments of the monitoring station will be housed in suitable enclosure / room
- Power supply to the station will be made from the central UPS system for all plant instrumentation / emergency shutdown systems for process plants
- The monitoring stations will include sampling & analysis provisions for NO_x, SO_2, suspended particulate (SPM) and Respirable Particulate Matter (RPM)

Environmental Budget

KPCL has proposed to take adequate measures to mitigate all possible adverse impacts at the plant premises. KPCL has earmarked an amount of Rs. 870.00 Crores for the Environmental Protection cost for the proposed project

Additional Studies

Risk Analysis for power plant at Godhna has been carried out with the objective to identify the potential hazards from the proposed pipeline, and proposed storage facilities and appropriate disaster management Plan has been designed.

Project Benefits

- Indirect employment opportunities to local people in contractual works like housing construction, transportations, sanitation, for supply of goods and services to the project and other community services
- Additional housing demand for rental accommodation will increase
- Market and business establishment facilities will also increase
- Cultural, recreation and aesthetic facilities will also improve
- Improvement in communication, transport, education, community development and medical facilities

Environmental Management Plan

Air Quality Management

- Suitably designed ESP with efficiency of not less than 99.9% will be placed downstream of the stacks which will separate out the incoming dust in flue gas and limit the dust concentration at its designed outlet concentration of less than 50 mg/Nm^3.
- For the effective dispersion of the pollutants stack height has been fixed based on the CPCB requirements. The height of the stack will be 275 m twin flue and is of single stack.
- The dust generated from coal handling plant will be insignificant because of handling of fine coal in closed circuit. For further suppression of dust adequate water spray system is being provided;
- Complete combustion takes place in the bed itself. Hence formation of carbon monoxide is not traced
- A well-designed burner system, will limit the temperature to a reasonably low value of NO_x.
- All vehicles and their exhausts would be well maintained and regularly tested for emission concentration;

- Adequate thickness of insulating material with proper fastening is being provided to control the thermal pollution;
- Provision of regular preventive maintenance of pollution control equipment; and
- Stack emissions will be regularly monitored by KPCL / external agencies on periodic basis.
- Space provision for retrofitting FGD system if required in future

Fugitive Emission Management

The following measures are being adopted:

- Dust suppression system by water sprinkler at dump hopper of coal
- Regular dust suppression with water sprinkler on the haul roads;
- Control of fugitive emissions from the ash pond through maintaining a permanent blanket of water cover over the deposited ash
- Green belt development and afforestation in the plant and surroundings of ash disposal area.
- Dust suppression/extraction system at Coal handling plant to control fugitive emission

Water Quality Management

- Continuous attempt to optimize/reduce the use of water in plant;
- Regular record of level and flow of surface water sources;
- Raw water quality will be checked on regular basis for essential parameters under BIS: 10500 before and after treatment;
- All the treated effluents would be monitored regularly for the flow rate and quality to identify any deviations in performance of effluent treatment plants.

Wastewater Management

About 24986 m^3/day of wastewater will be generated from the proposed power plant, which includes Boiler Blow down, DM clarifier wastewater, Main clarifier wastewater, Sludge, backwash and Sewage water.

The wastewater from the operating units will be subjected to necessary treatment to improve the quality of effluent to suit the regulatory requirement. A separate plant effluent drainage system will be formed. The plant effluents will not be mixed with storm

water/rain water. It is proposed to completely utilize the power plant effluents after treatment for plant reuse, to achieve zero discharge concept.

The sludge from Main Water Treatment Clarifier, DM plant clarifier, Ash water recovery clarifier, filter back wash water and RO plant reject will be sent to a sludge pit, from which the sludge will be pumped to the ash pond.

The domestic wastewater produced in places nearer to main plant will be treated in proposed STP. Further the effluent conforming to the stipulated standards from STP will be used for gardening purposes.

The domestic wastewater from far off places from the main plant will be provided with individual septic tank and then onwards will be lead to soak pit.

Storm Water Management

Based on the rainfall intensity of the proposed area, storm water drainage system will be designed and connected to the storm water networks. Storm water drainage system consists of well-designed network of open surface drains and rainwater harvesting pits along the drains so that all the storm water is efficiently drained off without any water logging.

Rain Water harvesting System

The rain (storm) water from the building roofs, non process area and grade level surfaces will be directed through the rain water harvesting structure and excess water will be directed through open drains to the storm drainage system. The storm water from the storm drainage system will be discharged outside the plant boundary. All drains will be lined and will be arranged to provide the shortest possible drainage path for efficient drainage.

Open drains will be made to collect the storm waters from first order seasonal stream and as well as dumps for disposal of solid wastes within project area.

Biological Environment

There is no removal of vegetation in the proposed site. Further plantation measures would help in preventing soil erosion.

There are no sensitive areas located in the close proximity to the project site.

Green Belt & Afforestation

The afforestation will be taken up around coal handling plants, ash disposal area and along roadside and pathways. Suitable plant species have been selected and planted based on the factors like availability of local species, resistance to pollutants, plant layout, meteorological conditions etc.

Approximately 1500 trees per ha will be planted in consultation with the local Forest Department. An area of about of 210 acres (85 Ha) of land in the plant and ash dyke area will be developed under greenbelt.

Socio-economic Environment

For the benefit of the community in the vicinity of the project, KPCL has been taking several measures to develop various amenities in an effort to improve standard of living,

Fire Protection System

- The plant proposes adequate number of wall/column mounted type portable fire extinguishers in various strategic areas of the plant including the control room, administration building, stores, pump house etc. These portable fire extinguishers are basically of carbon dioxide and dry powder type.

- Fire Hydrants at suitable locations for TG building, boiler area, Fuel handling & Storage area.
- Medium velocity water spray system for the cable gallery.
- Necessary electric driven, diesel driven, Jockey pumps with piping valves & instrumentation for safe operation.

Occupational Health & Safety

During operation stage, dust causes the main health hazard. Other health hazards are due to gas cutting, welding, noise and high temperature and micro ambient conditions especially near the boiler and platforms, which may lead to adverse effects (Heat cramps, heat exhaustion and heat stress reaction) leading to local and systemic disorders.

The precautionary measures, which will be followed to reduce the risk due to dust on the workers, engaged in and around the material handling areas:

- Adequate arrangements are made for preventing the generation of dust by providing the chutes at transfer points to reduce the falling height of material, preventing spillage of material by maintaining the handling equipment, isolating the high dust generating areas by enclosing them in appropriate housing and appropriately de-dusting through high efficiency bag filters;
- Massive afforestation will be undertaken in the plant. The tree cover acts as a very good sink for both gaseous as well as particulate pollutants.
- Due care will be taken to maintain continuous water supply in the water spraying system and all efforts would be made to suppress the dust generated by coal handling system by water spraying at appropriate points;
- Almost all material handling systems are automatic i.e. unmanned. The workers engaged in material handling system will be provided with personal protective equipment like dust masks, respirators, helmets, face shields etc;
- All workers engaged in material handling system will be regularly examined for lung diseases such as PFT (Pulmonary Function Test) tests;
- Any worker found to develop symptoms of dust related diseases will be changed over to other jobs in cleaner areas; and all necessary Medical care will be arranged
- Thermal insulation will be provided wherever necessary to minimize heat radiation from the equipment, piping, etc. to ensure protection of workers.

Insulation is being done by adequate cleats, wire nets, jackets etc. to avoid loosening. Insulation thickness is so selected that the covering jacket surface temperature does not exceed the surrounding ambient temperature by more than 15^{o}C. The effect of thermal pollution of air will be negligible considering the atmosphere as the ultimate heat sink.