CHAPTER - I

1.0 Introduction:

As per the Position Paper on the Power Sector in India published in December - 2009 by The Department of Economic Affairs, Ministry of Finance, Govt. of India, the capacity addition for generation of power in the 12th plan period is aimed at 90 GW with the objective to achieve Power for all by the year 2012 and considering the high growth rate of economy, the Govt. of India has envisaged capacity addition of 1,00,000 MW in next 6 years. This translates to almost doubling the existing capacity. Considering the fact that at present there is around 13% overall deficit of power availability with the present installed capacity, there is an immediate need to install power projects to achieve the economic growth projection which has been planned to meet the supply and demand equilibrium.

Prakash Industries Limited has expertise in development and execution of Steel, Mining and Power Projects. Planning forward with future vision for self reliance in core sectors, the company has set up an integrated steel plant at Village Hathneora in Champa Taluk of Dist. Janjgir-Champa. Being one of the key factors in higher value addition, company has always emphasized on backward integration to ensure the uninterrupted supply of quality raw materials. Company has been allotted three coal blocks at Chotia, Madanpur & Fatehpur in the State of Chhattisgarh.

The present proposal is for setting up 500MW [(2x100 MW & 2x150MW)] of coal based thermal power plant using CFBC Boilers for 2 x 100 MW & CFBC Boilers for 2 x 150 MW. The above facilities are planned by PIL at its existing plant site.

1.1 Project Proponent:

Prakash Industries Ltd was started in the year 1980. Planning forward, organizing for the future and performing ahead, that is what Prakash Industries Ltd. is all about. With focused vision in the core competence areas of Mining, Steel and Power, Prakash Industries Ltd. is rapidly carving its niche in the Indian steel industry. A fully integrated approach, strong financial foundation, understanding of market needs and the rich experience in the core strength areas have all contributed to the steady growth of the company. Prakash Industries Limited, one of the leading steel makers in the country is one of a dynamic organization having business establishments all over India.

1.2 Description of the Site:

The present expansion proposal is for setting up of 500MW [(2x100 MW & 2x150MW)] TPP at Village Hathneora in the existing plant premises of 630 Acres. Rivers Hasdeo which will fulfill the water requirement of the project, flows from North to South East of the area. The buffer zone is almost a flat terrain. Project site is at an elevation of 252 mtr. from sea level.

The nearest town is Champa at a distance of 5 km & NH 200 is at a distance of 1.2 km from the project site. The site is well developed and well connected with rail and road network. The nearest airport is at Raipur located at 200 km from the proposed site.

There are no monuments of archaeological importance, Defense Installation, National Park, Wild Life Sanctuaries, Tiger Reserve/Elephant corridor, etc. within 10 km radius.

The ash dyke of the proposed expansion project will be located at a distance of about 7km on an area of 200 acres belonging to villages Mudpar and Pachor in the Champa Tehsil of Distt. Janjgir-Champa. The Coordinate of the Ash pond is Latitude: 21°58'0"N and Longitude: 82°44'20"E.

1.3 Details of Proposed Project:

The gross capacity of the proposed project is 500 MW with a project cost of about 1750 Crores. The expansion is planned in phase manner as follows:

I Phase - (2 x 100 MW):-

The first phase of 2 x 100 MW consisting of 2 x 405 TPH CFBC Boilers and 2 x 100 MW TG shall be commissioned as follows:-

(i) 1 x 100 MW - By March 2015
(ii) 1 x 100 MW - By September 2016

II Phase – (2 x 150 MW):-

The Second Phase of 2 x 150 MW shall consist of a 2 x 505 TPH CFBC Boilers/PF Boilers and 2 x 150 MW TG. The same shall be commissioned as follows:-

(i) 1 x 150 MW - By March 2018
(ii) 1 x 150 MW - By March 2020

CHAPTER - II

2.0 Project Description:

The Thermal Power Plant will consist of 2x100 MW unit which will be based on CFBC boiler technology and 2x150 MW unit based on CFBC boiler technology.

2.1 2x100 MW TPP

Each 100 MW unit shall consist of 1 x 405 TPH CFBC boiler and 100 MW TG. It is propose to use mixed fuel consisting of coal, char and dust generated from ESP attached to WHRB of DRI units. Technological specification of CFBC boilers are as follows:

CFBC boilers for 2x100 MW

The technological parameters of CFBC Boilers are as follows:

Nos. and Capacity:	1 x 405 TPH for each 100 MW
Type:	CFBC coal fired, dry bottom, single reheat, balanced draft for outdoor installation
Steam Parameter:	145 Kg/cm^2 and 540 ± 5^{o}C

2.1.1 STEAM GENERATORS

The steam generator will be outdoor, natural circulation, single reheat, dry bottom, balanced draft single drum type unit designed for firing 100% indigenous coal and any combination thereof. The complete furnace section will be of welded wall type arranged as a gas and pressure tight envelope with circulating fluidized bed consisting of cyclone separators in the second pass of boiler.

The steam generator shall be Circulating Fluidized Bed Combustor (CFBC), with reheat, natural circulation, single drum, semi outdoor type unit, designed for firing of Indian Coal and blended fuel (Coal + Char + ESP Dust) as the principal fuel. CFBC Steam Generator comprises of mainly the following components and systems:

a) Pressure parts (furnace and convection heating surface pass);
b) Cyclone separators with two (2) cyclones located between the furnace and the second pass;
c) Fuel supply system;
d) Bed material supply system;
e) Air supply system;

f) Ash removal system;

g) Flue gas system

Main equipments of steam generator will include the Furnace, Furnace Wall System, Circulation System, Enclosure Steam Generator Casing and Framing, Deaeraor, Boiler feed pumps and drives and Electrostatic Precipitator. Brief details of the electrostatic precipitator and brief technical specification of boiler and auxiliaries are given below.

2.1.2 STEAM TURBINE GENERATOR

2.1.2.1 Steam Turbine

The steam turbine will be of single reheat, regenerative, condensing, multi-cylinder design with separate HP and LP casings and horizontal type with appropriate governing control coupled to the direct driven AC generator suitable for indoor installation. The turbine will be designed for main steam parameters of 139 Kg / cm2 (g), 537±5 ^{O}C at inlet of emergency stop valves of H.P. turbine and reheat temperature of 537 ^{O}C at inlet of emergency stop valves of L.P turbine. The exhaust from the HP turbine is fed to the LP turbine through Re-heater. The LP turbine will exhaust against condenser pressure of about 0.1 ata. The Turbo-generator set will be designed for a maximum throttle steam f low at Turbine Valve Wide Open (V.W.O.) condition of about 105% of Turbine MCR condition. Double casing turbine design will be preferred. The turbine will be designed for constant pressure operation and will be suitable for variable pressure operation. Depending on the capability of the machine, pressure operation shall be considered. The turbine will be suitable for cyclic operation al though it is intended for base load operation. The turbine shall be provided with suitable margins for VWO flow.

2.1.2.2 Turbine Generator

The Synchronous generators shall be totally enclosed, horizontal shaft driven directly by steam turbine at 3000 RPM. The generator shall be cylindrical rotor, continuously rated for the turbine outputs and rated at a minimum of 100 MW, 0.85 (lagging) power factor, delivering power at 11 kV 3 phase, 50 Hz star connected, in IP-54 enclosure. The generator will be provided with PMG excitation. The generators will be capable of operating in isolation or in parallel with the power grid, with voltage variations of ±10% and frequency variations of 47.5 to 52.5 Hertz. No load short circuit ratio of the generator at rated KVA and voltage will be about 0.5. The generator will have Class-F insulation with temperature rise limited to class`B' limits and shall be air cooled.

RAW MATERIAL REQUIREMENT FOR 2 x 100MW POWER PLANT

The total raw material requirement for 2x100 MW project will be 178 TPH in case of Blended fuel comprising of Coal 88 TPH , Char 66 TPH, ESP Dust 24 TPH .Total Water requirement will be 800 m^3/hr both for 2 x 100 MW and 2 x 150 MW units which will be fulfilled through Hasdeo river.

Table No. 2.1

Annual requirement of Raw Materials for 2x100 MW Power Plant

Sl. No.	Category	Amount (Ton)
1.	Indian Steam Coal	696960
2.	Char	522720
3.	ESP Dust	190080

2.2 2 x 150 MW TPP

Each 150 MW TPP shall consist of 1x505 TPH CFBC Boiler/PF Boilers and 150 MW TG. The plant envisages use of air cooled condensers. In case of CFBC Boilers, the unit proposes to use mixed fuel consisting of coal fines, char and dust generated from existing ESP attached to WHRB Boilers of DRI units, washery rejects etc having an average calorific value of about 2800 - 2900 kCal/kg.

2.2.1 Boiler

Case-I - CFBC boilers for 2x150 MW

The technological parameters of CFBC Boilers are as follows:

Nos. and Capacity:	1 x 505 TPH for each 150 MW
Type:	CFBC coal fired, dry bottom, single reheat, balanced draft for outdoor installation
Steam Parameter:	142 ata and 540 ± 5°C

The steam generator will be outdoor, natural circulation, single reheat, dry bottom, balanced draft single drum type unit designed for firing 100% imported coal, 100% indigenous coal and any combination thereof & combination of other fuels. The complete furnace section will be of welded wall type arranged as a gas and pressure tight envelope with circulating fluidized bed consisting of cyclone separators in the second pass of boiler. The steam generator shall be Circulating Fluidized Bed Combustor (CFBC), reheat, natural

circulation, single drum, semi outdoor type unit. CFBC Steam Generator comprises of mainly the following components and systems:

The cyclones shall be arranged behind the furnace. In the direction of the steam generator axis, the heating surfaces shall be arranged with the super-heater stages and economizer followed by the air pre-heaters. The arrangement of the main plant components shall allow locating the secondary and primary air fans aside the air pre-heater and the second pass. Each one on pneumatically operated power cylinder actuated regulating type dampers for each SA & ID fans. Then the two numbers of ID fan and two numbers of PA fan with drive motor each designed for 60% MCR. In CFBC firing system, fuel combustion should take place in the furnace in a dense internally circulating solids flow at a temperature of approx. 850°C. The discharge and thus externally circulating solid particles should be separated from the flue gas in two (2) ash separator cyclones and should then be re-circulated to the furnace through two (2) siphon seals which spread the ash flow to four (4) ash inlets into the combustion chamber.

The Electrostatic Precipitators will be designed for an outlet dust emission of <50 mg/Nm3 under MCR conditions. It is proposed to use LDO for start-up .

Case –II - PF Boilers for 2x150 MW :-
In case PF boiler is finalized for 2x150 MW power plants, following will be the technical Specifications and other details --

TECHNICAL SPECIFICATIONS OF PF BOILER

Front wall fired, Single drum, top supported, Natural circulation, Balanced draft, Semi outdoor, Water tube, Reheat, Pulverized coal Fired boilers are designed for front mill layout for the following conditions.

1. BOILER PARAMETERS

Following are the details of each PF boiler to be attached with 150 MW TG set.

Table No. 2.2
DETAILS OF PF BOILER

PARAMETERS		100% BMCR	100% TMCR
No. of boilers	No.	TWO	
Superheated steam flow at main steam stop valve outlet	TPH	505	462.65
Superheated steam pressure at main steam stop valve outlet	$Kg/cm^2(a)$	142	141

Superheated steam temperature at main steam stop valve outlet	°C	538 ± 5	538 ± 5
Reheat steam flow	TPH	414.08	391.91
Reheated steam pressure at Reheater –I inlet header	Kg/cm^2(a)	29.26	27.7
Reheated steam temperature at Reheater –I inlet header	°C	328.8	323.3
Reheated steam pressure at Reheater –II outlet header	Kg/cm^2(a)	27.76	26.29
Reheated steam temperature at Reheater –II outlet header	°C	538 ± 5	538±5
Feed water temperature at economizer inlet	°C	249.2	245.9
Feed water temperature at deaerator outlet	°C	186.1	183.7

2. BOILER PERFORMANCE PARAMETERS

Table No. 2.3

BOILER PERFORMANCE

Superheated steam temperature control range	% BMCR	60 - 100
Performance fuel		100 % E & F Grade coal
Excess air in flue gas at economizer outlet (100% BMCR)	%	20
Flue gas temperature at air heater outlet (100% BMCR)	°C	135

2.2.2 Steam Turbine Generator (TG) set

Each steam turbine shall be a multi cylinder, 3000 RPM, tandem compound, single reheat, condensing regenerative feed heating type unit. Each turbine shall be of MCR Capacity of 150 MW and shall be designed for main steam parameters of 142 kg/cm^2 pressure and 540 ± 5°C temperatures.

The exhaust steam from the Steam Turbine will be condensed in a double pass shell & tube type surface condenser. The condenser will be equipped with vacuum pumps for air evacuation and maintaining vacuum in the condenser. There will be 3x50% capacity Condensate Extraction Pumps (CEP) with each turbine to pump the condensate from the condenser hot well into the Deaerator through gland steam condenser, drain cooler and LP

Heaters. From the Deaerator, feed water will be pumped by 3x50% capacity Boiler Feed Pumps (BFP) (motor driven) into the economizer of the Boiler through HP Heaters.

2.2.3 Power Transmission to Grid

The power from the proposed 500 MW Power Project will be generated at around 11 KV and will be stepped up to 220 KV and will be connected to the state grid for further transmission of power to various consumers and utilities.

2.3 Fuel Requirement For 2x150 MW Power Plant:

100 % Indian Coal (in case of PF Boiler) and mixed fuel (in case of CFBC) will be used as Fuel in 2x150 MW unit. Fuel consumption per boiler is 117.2 T/h (234.4 T/h from both Boilers). The coal will be sourced from Chotia mines and rest will be obtained from e-auction. In case CFBC Boiler, proposed unit will make use of optimized natural resources. Coal, Char and ESP dust will be used as raw materials. Sol id waste Char & ESP dust generated from existing units will be utilized and power will be generated out of it. Coal transportation will be made through existing MGR route. Coal will be transport through covered railway wagons and unloaded at the proposed Coal Handling Area.

2.3.1 Water Requirement:

Total water requirement will be 28182 cm/day. The water balance for 28182 cum/ day is mentioned as billow.

Table No.2.4

Make up Water Requirement (m^3/hour) 2x100 MW & 2x150 MW

S.No.	Description of Unit	2x100 MW	2x150 MW	500 MW
1	Cooling Tower	585	69	654
2	DM Plant	52	105	157
3	Boiler Fed Pump	43	55	98
4	Ash Handling Pump	36	58	94
5	Sample Cooler	6	5	11
6	Potable Water	14	23	37
7	Service Water (AC other miscellaneous)	43	55	98
8	Sludge & evaporation loss	16	9	25
Total		**795**	**379**	**1174**

2.4 Manpower:

Total manpower required at plant during operation stage will be 200 including O&M staff and administrative personnel. Besides that, PIL will hire contractual labour and staff of about 200 persons for several jobs in and around the plant. The number of working days in a year will be 330 days with 3-shift operation of 8 hours each. In arriving at the above estimates of manpower, it has been conceived that the regular staff will carry out normal

day-to-day maintenance works. Major overhaul/maintenance works will be contracted out to equipment vendors and specialized agencies. Other ancillary services viz. canteen, housekeeping, township maintenance, security etc. would also be contracted out. Emphasis will be given to recruit the manpower from local areas nearby the plant.

CHAPTER – III

3.0 Existing Environmental Scenario:

The 10 kms radial distance from the plant boundary has been considered as study area for Environmental Impact Assessment (EIA) baseline studies. Environmental monitoring for various attributes like meteorology, ambient air quality, surface and ground water quality, soil characteristics, noise levels and flora & fauna have been conducted at specified locations and the secondary data collected from various Government and Semi-Government organization.

3.1 Meteorology:

On-site monitoring was undertaken for various meteorological variables in order to generate the site-specific data. Data was collected every hour continuously from 1st March 2011 to 31st May 2011 (Study Period) representing "Pre-Monsoon Season". The monthly mean of minimum temperature ranges from 10.4°C in November to 27.9°C in May. The monthly mean of maximum temperature ranges from 27.2°C in January to 42.7°C in May. The relative humidity found varying from 71% to 39%. The predominant wind directions are mostly N with 20%, W with 17% and NW with 15% direction. The rainfall does not show any cyclic occurrences and shows wide and erratic variations, ranging from as low as 4.5mm in November to as high as 434.8mm in August.

3.1.1 Ambient Air Quality (AAQ):

Air quality monitoring was done during summer season starting from March, 2011 to May, 2011 for **SPM, RSPM (PM_{10} & $PM_{2.5}$), SO_2, NO_x & O_3** Eight numbers of sampling stations were selected depending on wind flow pattern and the monitoring was conducted for a period of three months with the frequency of 2 days per week at each sampling station for all parameters except O_3 which was monitored for 1 hour in the peak hour of the day on each of the 2 monitoring days at a particular station. The Minimum and maximum concentration expressed in $\mu g/m^3$ are given below.

Table No. 3.1

Ambient Air Quality in $\mu g/m^3$

SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	O_3
110.8 – 179.5	33.4 – 73.4	13.6 – 29.4	5.1 – 6.7	9.7 – 14.2	4.4 – 5.8

3.1.2 Water Quality:

To evaluate the physico-chemical characteristics of the water resources existing in the study area, water samples from surface and ground water sources were collected during

the Pre-Monsoon Season. Eight samples from river water sources & Eight from ground water sources were analyzed for physical and chemical parameters.

3.1.2.1 Surface Water Quality:

The pH of the surface water samples of river Hasdeo varied from 6.8 to 7.6 indicating that water quality ranges from neutral to slightly alkaline in nature. Dissolve Oxygen varied between 4 to 6 mg/l and BOD level varied between 1 to 3 mg/l indicating that the water is not harmful for aquatic life.

3.1.2.2 Ground Water Quality:

The analysis results indicate that the pH ranges of ground water varied from 6.9 to 7.4, total dissolved solids varied from 288 to 385, Chloride varied from 105 to 135. It is observed all the parameters are within the limits of drinking water standard IS 10500.

3.2 Noise Level:

Ten noise level monitoring locations, expected to represent the different activities prevailing in the area, were selected so as to represent the entire study area.

3.2.1 Day Time Noise Level:

The day time noise levels at all the locations ranged between 47.1 and 58.5 dB (A). The maximum value was recorded at the core zone due to proximity of the existing plant site. The day time noise levels at all the Industrial locations, commercial locations and residential locations were observed to be within the prescribed limit of 75 dB (A) and 55 dB (A) respectively.

3.2.2 Night Time Noise Level:

The night time noise levels at all the locations ranged between 38.7 – 47.5 dB (A). The maximum value was recorded at the core zone due to proximity of the existing plant site. The night time noise levels at all the Industrial locations, commercial locations and residential locations were observed to be within the prescribed limit of 70 dB (A) and 45 dB (A) respectively.

3.3 Land Environment:

The land use pattern of study area falling within 10 km radius of the project site has been assessed on the basis of satellite imagery covering a total area of 630.00 Square Km. Details land use pattern of the study area as per satellite imagery have been summarized here.

Table No. 3.2

Land use Pattern in Study Area

Land Cover/ Land use Class	Area in Sq. Km.	% of Total Area
Settlement	54.8	8.7
Scrub Land	34.7	5.5
Land with/Without Scrub	26.5	4.2
Agricultural Land	422.0	67.0
Swampy/Marshy Land	30.2	4.8
River/Water body	33.4	5.3
Sandy Area	28.4	4.5
Total	**630.00**	**100**

3.3.1 Soil Quality:

A total of eight samples within 10 km radius of the plant site were collected for the assessment of soil quality. To evaluate the soil characteristics, one soil sample was collected from the proposed site premises and seven other locations in different revenue villages. It is observed that the pH of the soil in all the locations was varying from neutral to acidic. The electrical conductivity in S_1 and S_6 were higher than the other locations. Electrical conductivity is a measure of the concentration of soluble salts and ionic activity. Salt concentration is directly proportional to the osmotic pressure which governs the process of osmosis in the soil-plant system.

3.4 Ecology:

Based on the primary data collected during field visits, secondary data and literature survey, there are no endangered, threatened & protected plants and animal species in the study area. As per the site visit to the place it is found that there is no National Park/Wild Life sanctuary, Tiger Reserve and Elephant Corridor within 10 Kms radius of the proposed project.

3.5 Socio-Economic Condition:

As per 2001cencus the study area consists of 1,56,073 persons inhabited, out of which Total Male person is 78,743 and Female person is 77,330 in the study area of 10 km radial distance from the periphery of the proposed plant. The density of population reveals that the study area has an overall density of 247.73 persons per km^2. In the study area 25,490 of the population belongs to scheduled castes (SC) and 15,638 of the population belong to scheduled Tribes (ST).

CHAPTER - IV

4.0 Anticipated Environmental Impacts & Mitigation Measures:

The environmental impacts during construction and operation phases of the proposed project have been assessed and adequate management plan has been evolved to mitigate the impacts.

4.1 Impacts during Construction Phase:

4.1.1 Air Environment:

4.1.2 Impact Assessment:

- During construction phase the source of air pollution is fugitive emissions resulting from civil works and vehicular movements.
- The exhaust from vehicles

4.1.3 Mitigation Measures:

- The fugitive emissions are localized and will be controlled by water sprinkling both at site and on roads.
- The vehicles used will be environment compliant and conform to Euro – III Standards. Routine maintenance of the vehicles will be done to prevent emissions beyond permissible limit.

4.2 Noise Environment:

4.2.1 Impact Assessment:

The increase in Noise Level may be due to movement of vehicles and from operation of various construction equipments.

4.2.2 Mitigation Measures:

This impact will be mitigated by regulating the movement as well as proper maintenance of the vehicles and by providing ear muffs/ plugs to the persons involved in work near the machines.

4.3 Water Environment:

4.3.1 Impact Assessment:

- The run-off water from the construction site may contain sediments and oil and grease due to maintenance of vehicles.

- The sanitary wastes from labour colony.

4.3.2 Mitigation Measures:

- Sedimentation tank will be made to settle the sediments before discharging waste water for other uses.
- For separation of oil and grease, traps will be provided at suitable locatons.
- The labour colony sanitary waste water will be passed to septic tanks.

4.4 Land Environment:

4.4.1 Assessment of Impact:

The land identified for the proposed 500MW Power Plant is about 128.74 acres for main plant & machinery and about 200 acres of the land will be used for ash disposal. The proposed site is industrial land as it is in the premises of existing steel plant units. Therefore, there will be no felling of trees and no change of vegetation of the area. There is no forest land in the project site as well as in the study area. The land use pattern will therefore change from agricultural to industrial.

4.4.2 Mitigation Measures:

- The earth generated during excavation of water reservoir and ash pond within the project premises will be used for grading the plant area. Hence, no major impact is envisaged on land use pattern of the project site or buffer zone.
- In order to facilitate drainage of the project site storm water drain will be excavated.

4.5 Soil Quality Management

The following measures shall be adopted to prevent/reduce the soil contamination:

- Litter, fuel oil drums, used grease cartridge would be collected and removed properly.
- Dust bins shall be placed at requisite locations.
- Lubricating waste oil shall be collected separately in drums and shall be sent to used oil re-processor unit.

4.6 Ecology Management

- Excavated soil from foundation work will be back filled.

- Surplus quantity of rubbish need to be cleared and utilized to fill up low laying areas immediately after completion of construction activities .

4.7 Operation Phase:

During operation phase there may be substantial impact on air quality due to various emissions and on land environment due to solid waste disposal. As the proposed plant will operate on zero discharge concept there will be very less impact on water environment.

4.7.1 Air Environment:

4.7.2 Assessment of Impact:

The result of the modeling study indicates that the maximum incremental PM_{10} Conc. of 0.90637 µg/m^3 will be experienced at distance of 2 Kms South-East of project site at ground level. Similarly the maximum Incremental SO_2 Conc. of 13.41552 µg/m^3 will be experienced at distance of 2 Kms South-East of project site at ground level. The maximum Incremental NOx Conc. of 13.74368 µg/m^3 will be experienced at distance of 2 Kms South-East of project site at ground level.

With respect to receptor locations the result of the modeling study indicates that the maximum GLC after the expansion would be 72.47101 µg/m^3 with respect to PM_{10}, 20.11552 µg/m^3 with respect to the SO_2 and 26.34368 µg/m^3 with respect to the NOx which are within the limit of NAAQS. The GLC predicted at all receptor locations after the proposed expansion are well within the PM, SO_2 and NOx limit prescribed in NAAQS by MoEF.

4.7.3 Mitigation Measures:

The air pollution mitigative measures conceived for the project is summarized below:

- Multi flue stack of 125m height for 2x100 MW & multi flue stack of 220 m for 2x150 MW as recommended by MoEF conceived for proper dispersion of pollutants through the stacks. There will be one stack attached with CFBC Boilers (2 Nos.) of 2 x 100MW Power Plant and one stack attached with CFBC Boilers (2 nos.) of 2 x 150MW Power Plant. Low NOx burners are also conceived in both the plants to restrict NOx generation.
- High efficiency ESP also conceived for this particular project to restrict PM emission at chimney outlet limited to less than 50mg/Nm^3 to ensure conformity to

the "*Charter of Corporate Responsibility for Environmental Protection* (CREP)" recommendation of the MOEF, Govt. of India.

- Space provision for FGD will also be there.
- Dust extraction and dust suppression system conceived for the suppression of fugitive dust during unloading and handling sections of coal.
- Water spraying also conceived in ash silo area for suppression of fugitive dust in ash silo area.
- A green belt of adequate width is also conceived around the air pollution sources and also along plant boundary to restrict air pollution.

4.8 Noise Environment:

4.8.1 Assessment of Impact:

- During the normal operation of the plant equipments, the ambient noise levels are expected to increase significantly with the attributes of respective equipments, but these noise levels will be restricted to small area close to it.
- The running of pumps, compressors, blowers, DG Sets will increase the noise level of concerned area.
- The blowing of safety relief valves and venting of steam etc. also will increase the noise level.
- Movement of heavy duty vehicles also will increase the noise level.

4.8.2 Mitigation Measures:

- In general, noise generating items such as fans, blowers, compressors, pumps, motors etc. will be so specified as to limit their speeds to less than 1500 rpm and reduce noise levels. Static and dynamic balancing of equipment will be insisted upon and will be verified during inspection and installation.
- Provision of silencers shall be made wherever possible.
- The insulation provided for prevention of loss of heat and personnel safety shall also act as noise reducers.
- The CHP will be a unit enclosed by brick walls.
- The green belt around the CHP will act as secondary barrier as well as natural noise barrier and will decrease the noise level further.
- The equipment, which is the source of noise, will have built-in type noise control abatement technology.

- Noisy plant & machineries (e.g. crushers and workshops) will be located away from residences and centers of heavy worker concentration.
- Besides, ear muffs / plugs will be provided to the personnel in the close vicinity of noise sources.
- A green belt of adequate width conceived around plant boundary and other strategic locations will also reduce noise pollution.
- A well planned layout shall be made so as to maintain a greater distance between the source and receiver.
- Damping materials for wrapping the work places like compressor room, D.G.set etc.
- In case where the operation of the equipment warrants the presence of operators in close proximity to equipment, the operators will be provided with necessary safety and protection equipment such as ear plugs, ear muffs etc.
- Occupational Health and Safety Administration System (OHSAS) for evaluation of exposure of noise pollution on the associated staff and comparing it with permissible exposure and subsequently taking corrective actions will be developed.

4.9 Water Environment:

4.9.1 Assessment of Impact:

All waste water generated will be treated and reused. About 576m^3/hr of waste water will be generated which will be reused for ash handling system, coal handling and horticulture after proper treatment. The plant will be operated on "Zero Discharge Concept". Hence, there will be no impact on water environment.

4.9.2 Water Pollution Mitigation Measures:

i. Wastewater Management philosophy will be based on "Zero Liquid Discharge Approach".

ii. The underflow sludge from the raw water treatment will be sent to a settling pond. The clear overflow from the pond will be used for green belt development & dust suppression.

iii. Main plant drains consisting of waste water having light density, fine suspended particles from different areas as well as other effluents such as boiler blow down, water treatment plant waste will be neutralized in a neutralization pit before discharge to guard pond. Service water drains etc will also led to a guard pond. The resulting clear water will be used in CHP dust suppression, Horticulture & green belt

development, and balance quantity will be transferred to ash handling plant water sump.

iv. Effluent from coal handling plant (CHP) primarily consisting of coal dust laden water from various dust extraction points as well as dust suppression system and run-off water from coal-pile will also be led to a guard pond. Effluent from oil unloading area will be taken to oil removal system; where clear oil will be taken to a storage tank and the water led to the guard pond. Skimming tank is provided separately to remove contaminated oil etc.

v. Effluents from the DM plant resin regeneration circuits, generally acidic from the cat-ion units and alkaline from the anion units, will be neutralized in a neutralizing pit. The neutralized effluent shall have less than 5 ppm suspended solids and a pH value of about 7.5 to 8.0 in line with CPCB standards. The neutralized effluents will be led into the ash water pond.

vi. The run-off from the coal handling area will flow into the drains which will be suitably provided at various places in the coal yard. The run-off collected in this manner will be led to a common sump where it will be pumped into the storm water drain and ultimately into the ash slurry sump.

vii. It is proposed to dispose the sewage from the various buildings in the power plant as well as the colony through a combined sewage treatment tank. The effluents from the sewage treatment plant will be disposed off suitably.

viii. Regeneration of de-generated water bodies around the project site. Due to the project activities natural drainage pattern of the area is not disturbed. Hence, regeneration of degenerated water bodies is not required.

4.10 Solid Waste:

4.10.1 Assessment of Impact:

The quantity of ash generated from the plant is estimated at about 17.75 LTPA. This will be the largest source of solid waste. The fly ash generated will be utilized as per the guidelines set by MoEF.

There will be domestic solid waste generated from the plant which will be predominantly organic and biodegradable in nature. In addition there will be sludge from Sewage Treatment Plant.

4.10.2 Mitigation Measures:

The main solid waste management of this project includes ash management generated due to combustion of coal. Main features of the solid waste management plan conceived for the project is as follows:

(i) Intermittent wet or dry removal and disposal of bottom ash
(ii) Intermittent dry evacuation of fly ash
(iii) Dry collection of fly ash in Silo
(iv) Disposal of ash slurry through HCSD System to Ash Pond.

PIL has already identified 200 acres of land for Ash Dyke for 2x100 MW and 2x150 MW which is about 7 Km from the project site. Land acquisition is under progress.

- Domestic solid waste being biodegradable in nature will be converted into manure using vermi-composting. It will be roughly 30-40 kg/day.
- The sludge from the sewage treatment plant will be dried, vermin-composted and used as manure for greenbelt maintenance.

4.11 Ecology:

4.11.1 Assessment of Impact:

- The emission form the stacks of the plant, fugitive emissions, higher levels of noise and illumination of the area may drive the fauna away from the plant site and may affect the flora of the adjoining locality, protected and reserve forests.
- The aquatic ecology may get affected if the effluent water of plant operation mixes with the local natural streams.

4.11.2 Mitigation Measures:

- In order to protect the flora and fauna, green belt and of adequate width and height will be developed. The trees selected will attenuate noise and air pollution.
- There will be no discharge from the plant as all waste generated will be re-used in the plant after proper treatment. The company will work on “Zero Liquid Discharge Concept”.

4.12 Socio-economic Condition:

There will be positive impact on the socio-economic condition of the people of the locality. Not only that the Industrial activity will bring in economic changes but also the planned implementation of CSR programmes of the company will change the education level, sanitation of the area etc. In addition to payment of additional royalty, sales tax

and excise duty to the government, PIL shall continue its efforts to improve the socioeconomic status of the local habitants. It shall review various welfare schemes going on in the area from time to time and take appropriate decisions of modifications/additions of welfare schemes as per requirement of local habitants.

4.13 Occupational Health and Safety:

4.13.1 Assessment of Impact:

During operation phase, 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 operating and platforms which may lead to adverse effects (Heat cramps, heat exhaustion and heat stress reaction) leading to local and systemic disorders. Injuries in industries are usually of minor nature like bruise, cuts, and abrasions because of manual handling. However, serious accidents due to common reasons like fall from height and entrapment of limbs in machinery are also possible.

4.13.2 Mitigation Measures:

- Adequate arrangements will be made for preventing the generation of dust by modifying the chutes at transfer points for reducing 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.
- 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 will be 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.
- Any worker found to develop symptoms of dust related diseases will be changed over to other jobs in cleaner areas.

CHAPTER - V

5.0 Environnemental Monitoring & Management Programme:

Monitoring of different Environmental Parameters will be done regularly as per the schedule and the activity will be coordinated by the Environmental Management Cell (EMC). The existing Environmental Monitoring Cell is well equipped to take up environmental monitoring of the expansion. Details of the proposed environmental monitoring are described below:

5.1 Environmental Monitoring Methodology:

Monitoring of wind speed, wind direction, temperature and relative humidity on continuous basis will be done by the EMC.

Ambient Air Quality (AAQ) shall be monitored to assess the levels of Suspended Particulate Matter, Respirable Particulate Matter (PM_{10} & $PM_{2.5}$), SO_2, NOx and O_3. There will be three AAQ locations inside the plant and three AAQ locations around the plant. Monitoring will be conducted twice a week. On line monitoring for Particulate Matter (PM), SO_2, NO_X, CO and CO_2 for each stack will be provided to the extent possible. However, the frequency of monitoring may be modified according to the conditions prescribed by the State Pollution Control Board. Work-zone air quality shall be monitored once a month, to assess the levels of Suspended Particulate Matter in side the plant complex.

5.2 Budgetary Provision:

Table No. 5.1
Budgetary Provision

A) Setting up of the Environmental Laboratory:			**(Rs. in Lakhs)**
Sl. No.	**Heads of Expenditure.**	**Estimated Expenditure**	**Total Exp. for Setting Up Laboratory**
1.	Instrument / equipment.	50.0	Capital Cost 140.0
2.	Infrastructural facilities of Lab.	20.0	
3.	Environment Department	70.0	
4.	Recurring Cost for consumables/ Yr.	50.0	50.0
B) Manpower :			
Sl. No.	**Designations**	**No. of Manpower**	**Recurring Exp. per Annum**
1.	Manger (Environment)	01	**10.0**
2.	Environmental Scientist	02	
3.	Scientific Assistant	03	
4.	Laboratory Assistant	03	
5.	Field / Laboratory Attendant	02	
Total Manpower Required		**11**	

Total Capital Cost: Rs.140.0 lakhs, Recurring Cost: Rs.60.0 lakhs per Annum

CHAPTER - VI

6.0 Additional Studies - Risk Assessment & Disaster Management Plan (DMP)

The plant handles a number of materials like Coal dust, LDO and LSHS which are hazardous /toxic in nature. Certain process intermediates may also be hazardous/toxic/hot. Electric power and supply may also cause accidents. Hence, risk assessment shall be done and disaster management plan will be developed.

6.1 Disaster Management Plan:

Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that exist in the proposed power plant operations. On the other hand, risk analysis deals with the recognition and computation of risks, the equipment in the plant and personnel are prone to, due to accidents resulting from the hazards present in the plant.

Risk analysis follows an extensive hazard analysis. It involves the identification and assessment of risks the neighboring populations are exposed to as a result of hazards present. This requires a thorough knowledge of failure probability, credible accident scenario, vulnerability of population etc. Much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum credible accident studies.

In the sections below, the identification of various hazards, probable risks in the proposed power plant, maximum credible accident analysis, consequence analysis are addressed which gives a broad identification of risks involved in the plant. The Disaster Management Plan (DMP) has been presented.

- Identification of potential hazard areas;
- Identification of representative failure cases;
- Visualization of the resulting scenarios in terms of fire (thermal radiation) and explosion;
- Assess the overall damage potential of the identified hazardous events and the impact zones from the accidental scenarios;
- Assess the overall suitability of the site from hazard minimization and disaster mitigation point of view;
- Furnish specific recommendations on the minimization of the worst accident possibilities; and
- Preparation of broad Disaster Management Plan (DMP), On-site and Off-site Emergency Plan, which includes Occupational and Health Safety Plan.

CHAPTER - VII

7.0 Project Benefit

About 500 numbers of persons are likely to be engaged in the proposed expansion project during construction phrase and 200 persons in operation phase. Infrastructural facilities like communication, education and transportation will increase. The additional power generated due to operation of the TPP will augment the power requirement of the region and the country at large. Good number of ancillary facilities also will develop in the nearby area which will generate direct and indirect employment. Overall economy of the area will improve.

CHAPTER - VIII

8.0 Environment Management Plan (EMP):

8.1 Environmental Management Cell (EMC):

For administering the environment aspects, an EMC will be formed. The Cell will be headed by a General Manager and have 23 members in a team including an Environmental Manager. This team will be responsible for all environment management activities including environmental monitoring, developing greenbelt, ensuring good housekeeping, ensuring statutory compliance as well as creating environmentally aware work forces for proposed steel plant. To evaluate the effectiveness of environmental management program, regular monitoring of the important environmental parameters will be taken up. The schedule, duration and parameters will be as per the consent conditions of No Objection Certificate issued by the State Pollution Control Board for 100% compliance.

8.1.1 Laboratory Facilities:

A well equipped laboratory will be set up for analyzing Air, Water, Effluents, Solid wastes, Raw materials and other process intermediates.

8.2 Environmental Management Plan (EMP) - Monitoring Aspects

Air Environment -

- A meteorological station will be set up at a suitable location to monitor wind speed, wind direction, temperature and relative humidity on continuous basis.
- The Ambient Air Quality, Stack Emissions and Fugitive Emissions will be monitored and analyzed for Particulate Matter, SO_2, NOx, CO, CO_2 & O_3 in a schedule manner as per directives of State Pollution Control Board and corrective measures shall be taken.
- On-line Stack Monitoring facility will be provided for continuous monitoring of exhaust gases.
- The efficiency of all pollution control devices like ESPs and bag filters will be checked and their operability will be ensured on day to day basis.

Water Environment -

- Zero discharge of effluents will be ensured.
- The drainage system will be checked regularly and clogging, accumulation of sludge and sediments will be removed.

- Performance of Oil & Grease traps, settling ponds, neutralization pits and ETPs will be examined on day to day basis.
- Quality of Raw water, Drinking water and Waste water will be monitored at least twice in a month.
- The Ground water monitoring will be done at least every 3 months in locations around the Plant.

Noise Environment -

- The Noise levels inside the plant will be monitored in noise prone areas both in day and night time.
- Noise Protective Appliance like Ear Muffs, Ear Plugs will be issued to workmen in noise prone areas and it will be ensured that, they use the same.
- Performance of silencers provided at various vent points will be periodically examined and corrective action taken.

Solid Waste -

- Quantity and Characteristics of Solid Wastes will be regularly analyzed and their disposal will be monitored.
- It will be ensured that, Fly Ash is used in company's own cement plant/fly ash brick plant or supplied to cement and fly ash brick manufactures.

8.3 Environmental Audit:

Quarterly Environmental Audit will be carried out to check for compliance with standards. This will be carried out by in-house experts. Third Party Environmental Audits will be carried out once in every year.

The directives from the Statutory Authorities and prevailing regulations will govern the periodicity of monitoring.

The action plan of EMP will be updated every year with respect to the results achieved and to plan activities for the next year.

8.4 Green Belt:

Green Belt will be developed as per the statutory guidelines. The EMC will monitor the plantation and maintenance of the proposed green belt & also will work after the aesthetic of the proposed plant.

8.5 Training of Man Power:

Training will be imparted for safe operation and maintenance of the Plant. Safe operating and Safe Maintenance manuals will be issued to concerned personnel.

8.6 Occupational Health:

To ensure proper health of the working personnel, regular health checkup will be carried out as per provision of Factories Act. Proper house keeping of the shop floors will be maintained. Fire fighting equipment and other safety appliances will be tested regularly to ensure full serviceability. Training of employees for use of safety appliances and First Aid will be imparted. Separate Wing with adequate knowledge of industrial hygiene will constantly check for any occupational disease.

CHAPTER - IX

9.0 Conclusion:

In view of the above it can be concluded that, the proposed project is in line with the principles of sustainable development. Due to the project there will be appreciable improvement in social as well as economical status of the area. The mitigation measures those will be adopted will restrict the adverse impacts well within the tolerable limit. Hence, it is logical that the above project should come up at the earliest along with implementation of the mitigation measures. The EMC will monitor the plantation and maintenance of the proposed green belt and also look after the aesthetic of the Proposed Plant.

ABBREVIATIONS

TPM	Total Productivity Management	PM_{10}	Particulate Matter-10
ISO	International Organization for Standardization	$PM_{2.5}$	Particulate Matter-2.5
TPP	Thermal Power Plant	SO_2	Sulphur Dioxide
MoEF	Ministry of Environment and Forest	NOx	Nitrogen Oxides
CPCB	Central Pollution Control Board	CO	Carbon Monoxide
CGWB	Central Ground Water Board	AQI	Air Quality Index
Nm^3	Normal Cubic Meter	Hg.	Mercury
TPH	Ton Per Hour	NTU	Nephelo Turbidity Units
TPD	Ton Per Day	BOD	Biochemical Oxygen Demand
DM	De-mineralization	COD	Chemical Oxygen Demand
CHS	Coal Handling System	DO	Dissolved Oxygen
AAQ	Ambient Air Quality	ND	Not Detectable
PM	Particulate Matter	DFO	Divisional Forest Office
mg	Milligram	COC	Cycles of Concentration
µg	Microgram	dB(A)	Decibel in 'A' Scale
ESP	Electro Static Precipitator	EIA	Environmental Impact Assessment
MW	Mega Watt	EMP	Environmental Management Plan
ETP	Effluent Treatment Plant	CREP	Corporate Responsibility for Environmental Protection
MSL	Mean Sea Level	EMS	Environmental Management System
NH	National Highway	IMD	India Meteorological Department
LDO	Light Diesel Oil	LSHS	Low Sulphur Heavy Stock
N	North	MCM	Million Cubic Meter
E	East.	BDL	Below Detectable Limit
^0C	Degree Centigrade	GLC	General Level Concentration
S	South	CHP	Coal Handling Plant
ID	Included Draft	SW	South-west
FD	Forced Draft	EMC	Environment Management Cell