

## **Executive Summary**

### Introduction

The state of Chhattisgarh was carved out of the state of Madhya Pradesh on 1<sup>st</sup> November, 2000. Chhattisgarh is endowed with rich mineral resources mainly coal. Before the creation of the renewed thrust on industrialization, the power demand is estimated to increase at an accelerated pace and to cater to this demand, the state government has adopted an aggressive policy for addition of power generation capacity in the immediate future. Government is also trying to achieve a rate of growth of GDP of 8-10% p.a. in near future. In order to support that growth rate, power supply needs to grow at a rate of over 10-11% p.a. Also by utilizing the rich coal deposits in the state, the state intends to become a power hub and supply power to power deficit states in the western regions and other regions.

The liberalized policy launched in 1991 to encourage private sector participation in power generation permitted private developers to establish power projects both independently and in the joint sector through public/private participation in the power sector.

Electricity Act, 2003 has ushered paradigm shifts in the power sector. Competition will be possible not just in generation, but also in every facet of the sector including transmission and distribution. Private sector investment will be facilitated by greater transparency. The Act permits free entry into generation unless there are overriding safety and environmental concerns. The Act also promises non-discriminatory open access to the transmission system. To this end, the Central Electricity Regulatory Commission has framed the regulation for the "Open Access in inter-state Transmission" in January, 2004. This will facilitate the bulk sale of energy from generators to the customers and will end the problems of the single buyer model. This has introduced the idea of trading in wholesale electricity. Open access thus would encourage and enable private investors to enter into power generation and sell it directly to consumers. This would begin with bulk consumers and gradually extend up to the householders.

Considering the above power scenario in the State of Chhattisgarh & Western Region, the need for setting up of the 70 MW (2 x 35 MW) (Coal, Dolochar and Washery Reject based) power plant (Coal, Dolochar and Washery Reject based) in Chhattisgarh by M/s Vandana Energy & Steel Pvt. Ltd. (VESPL) is justified.

VESPL has retained Anacon Laboratories, Nagpur to undertake an Environmental Impact Assessment study for the proposed 70 MW Thermal Power Plant and suggest an effective environmental management plan for minimizing the adverse environmental impacts of the project.

## **1.0 Project Description**

### Site Details

The proposed power plant will come up at village Chhurikhurd, Dhanras, Chorbhatti and Jhora, Tahsil: Katghora, Dist.: Korba, Chhattisgarh. The site admeasuring 33.0 ha is located at 22° 29' 21.83" to 22° 29' 58"N latitude & 82° 37' 28.93" to 82° 37' 53.45"E Longitude. The plant site has been selected based on the availability of fuel,

water and facilities for power evacuation. **Figure-1** indicates the project site and other features within 10km around it.

### Thermal Power Generation Process

In combustion process, energy of fuel is converted into thermal energy, which is then converted into mechanical energy through a turbine and finally into electrical energy through generator. The boiler walls are lined with tubes containing high quality demineralised water (known as boiler feed water). The combustion heat released from the fuel is absorbed by the boiler tubes and the heat converts the boiler feed water into steam at high pressure and temperature. The steam discharged through nozzles on the turbine blades rotates the turbine, which in turn is coupled to a generator. Electricity produced will be passed through a step-up transformer and power then be evacuated via switch yard through a transmission system.

## **2.0 Description of the Environment**

The baseline environmental quality data for various components of environment, viz. Air, Noise, Water, Land and Socio-economic were generated during December 2007 to February 2008 in the study area covering 10 km around the project site. Other environmental data on flora and fauna, land-use pattern, forest etc were also generated through field surveys and also collected from different state Govt. Department.

### **2.1 Air Environment**

Ambient air quality was monitored at 12 locations. Results indicate that concentrations of SPM, RPM, SO<sub>2</sub>, NO<sub>x</sub> and CO are well within the prescribed standards.

SPM	-	89 to 204 $\mu\text{g}/\text{m}^3$
RPM	-	33 to 77 $\mu\text{g}/\text{m}^3$
SO <sub>2</sub>	-	5.8 to 12.4 $\mu\text{g}/\text{m}^3$
NO <sub>x</sub>	-	8.3 – 14.5 $\mu\text{g}/\text{m}^3$
CO	-	< 100 $\mu\text{g}/\text{m}^3$

An automatic weather monitoring station was installed at the project site to record micro-meteorological data. Dominant wind directions recorded are from N, NE and E.

### **2.2 Noise Environment**

The noise levels in the study area are within the prescribed standards. Noise levels ranges from 40.0 dB(A) to 48.0 dB(A) during day time and 32.0 dB(A) to 44.0 dB(A) in the night time.

### **2.3 Water Environment**

Groundwater occurs in the area in the form of shallow occurring, unconfined aquifer as well as semi-confined, moderately deep aquifers. Groundwater development has been estimated as 25.18% in the region. This region has been rated “safe” according to the Central Groundwater Board, Govt. of India and the Groundwater Survey Circle, Govt. of Chhattisgarh

It has been observed that all the physico-chemical parameters and heavy metals of water samples from surface and ground water are below the stipulated drinking water

standards. The pH, TDS, and Dissolved Oxygen of the surface water were found in range of 7.5– 7.6, 56-164 mg/lit and 6.2-6.4 mg/lit respectively, whereas the ground water showed pH 7.10 -7.67, TDS 155-495 mg/lit.

## 2.4 Land Environment

About 37% of the total study area is forest land, 36% is agricultural land, 11% is waste land and the remaining 16% is uncultivable land. .

Land use pattern within the study area is given below:

Total Area	Forest Land	Irrigated Land	Unirrigated Land	Culturable Waste Land	Unclutivated Land
26651	9763	518	9186	2900	4284

## 2.5 Soil

The soil quality assessment was carried out at eight locations. The bulk density of the soil in the study area ranges between 1.32 to 1.43 g/cc, which indicate favorable physical condition for plant growth. The porosity and water holding capacity of the soils are in the range of 34.65% to 40% and 31.62 % to 38.66% respectively. Variations in the pH of the soil is found to be neutral (6.73 to 7.83), thus conducive for growth of plant. Organic Carbon and Nitrogen are found in the range of 0.82 – 2.07% and 266 – 624 kg/ha. This shows that soil is moderately good in organic and nutrient content.

## 2.6 Flora & Fauna

About 37% of the study area is covered by forests. Few trees of Sal, Mahuwa, Moin and Karm exist in the project area and they will not be cut during the construction of the buildings.

Forests in the study area fall under the category of “Tropical Wet Deciduous Forest”. Density of the trees in the forest areas is quite high while in some area the density is low. Sal (*Shorea robusta*) is the predominant species with Saja (*Terminalia tomentosa*) Arjuna (*Terminalia arjuna*) Tendu (*Diospyrox mclanoxylon*), Mahua (*Madhuca indica*), Bija (*Pterocarpus marsupium*) and Dhaura (*Anogeissus latifolia*) being the main associates. Sporadic growth of Bamboos occurs in the hilly areas.

Sighting of wild animals in the study area is quite rare. No wild animals except langoors, monkeys, hare, jungle cat and rarely a deer species are seen in the remote areas of hilly and rugged forest terrain that forms the northern most and the southernmost extremities of the study area. The central portion occupying comparatively flat low lying area is occupied by agricultural activity and is moderately populated rearing large herds of domestic cattle.

There is no National Park, Sanctuary, Elephant or Tiger Reserve within 10 km radius around the project site. No migratory route of wild animals has been reported.

## 2.7 Socio-Economic Environment

Demographic data indicates -

The total population of the study area is 76086 with 14809 households.

The scheduled castes & scheduled tribes percentage of the total population of the study area is 9.12% and 34.36% respectively.

The literacy rate in the study area is 48.94%.

54.25% of the main workers are engaged in agriculture and allied activities.

#### Awareness and opinion about the project

The respondents from most of the villages are aware of the project. They have good opinion about the project as it will improve the economy, infrastructural facilities, job opportunities and business opportunities of the villagers. The cultivators are in favour of the project. The educated youths opined that the management should give preference to them / local people.

#### Commitment of VESPL towards Social Welfare Activities

The project will provide full opportunity for local people to get employment and help in the up liftment of socioeconomic status of the area. The commitments of management include up liftment of social, health, basic needs of drinking water supply and provision of education facilities. Management will develop green belt to improve aesthetic quality of the region.

### **3.0 Anticipated Environmental Impacts and Mitigation Measures**

The environmental impacts have been assessed assuming that the pollution due to the existing activities in the area where project is planned has already been covered under the present environmental scenario established by the monitored baseline data.

Various impacts during the construction and operational phase on the environment parameters have been studied to estimate the impact on the environment.

#### **3.1 Land Environment**

The proposed project site is fairly flat with shrubs growing at some places. Structures such as industrial buildings, stack, waste disposal facilities etc. will be constructed. The tallest structure will be a 110m high stack.

The project area is of 33.0 ha. Clearing of shrubs is required during construction phase. No matured tree will be cut from the project site. It is proposed to carry out plantation in about 30% of the total project area, which will not only nullify the impact due to vegetation loss during the construction phase but will also improve aesthetic aspects.

Combustion of coal will result in fly ash and bottom ash generation. A part of ash will be stored in Silos at the project site. Ash beyond the silos capacity will be disposed of in a HDPE lined ash pond in slurry form. VESPL will be installed a fly ash bricks and fly ash aggregates plants to use the fly ash generated.

Temporary houses will be provided for construction labour. The area will be developed aesthetically so that there no significant adverse impact during operational phase.

#### **3.2 Air Environment**

The air pollution impact from a thermal power plant depend upon factors like design, capacity, process technology, quality of fuel used for combustion, operation &

maintenance of process units and air pollution control measures adopted in individual units.

Particulate Matter, Sulphur Dioxide and Oxides of Nitrogen are the main pollutants from the proposed plant. Combustion of coal, dolochar and washery reject in the boiler will generate 586 TPD ash. About 20% of this will be bottom ash and the remaining 80% ash will be carried along with the flue gas in the form of particulate matter as fly ash. To limit the concentration of the fly ash to below 50 mg/Nm<sup>3</sup>, electrostatic precipitator of 99.8% efficiency will be installed. A 110 m high stack will be provided for adequate dispersion of pollutants. The NO<sub>x</sub> emissions from the boiler will be controlled by providing low NO<sub>x</sub> burner.

The Industrial Source Complex (ISC) model was applied with the flat terrain option. The ground level impacts of individual pollutants i.e. SO<sub>2</sub>, NO<sub>x</sub> and SPM from the proposed thermal power plant were predicted in terms of 24 hourly average concentrations. The ground level concentrations (GLCs) of the individual pollutants have been computed at 250 m distance interval within the study area of 10 km radius to superimpose over baseline data. The prediction results in this study, corresponding to winter season are shown in the form of concentration isopleths which also indicate the spatial distribution of concentration levels. During the normal operating conditions, the pollutant incremental concentration will be much less than the worst case scenario projected. The values are as follows:

SPM	0.10 to 0.6 µg/m <sup>3</sup>
SO <sub>2</sub>	0.1 to 3.5 µg/m <sup>3</sup>
NO <sub>x</sub>	0.1 to 1.3 µg/m <sup>3</sup>

The predicted resultant concentrations indicate that TSPM, SO<sub>2</sub> and NO<sub>x</sub> will be below prescribed standard for residential and rural areas.

### 3.3 Water Environment

The water requirement of about 340 m<sup>3</sup>/hr, which will be met from the Hasdeo River. Adequate capacity water reservoir will be provided.

Waste water from cooling water system and boiler blow down will be neutralized and will be stored in guard pond. 57 m<sup>3</sup>/hr of waste water will be generated. Treated waste water will be recycled and reused for dust suppression, cooling, plantation etc. There will be no impact on the water regime due to the effluents from the proposed unit. Adequate rainwater harvesting measures will be implemented to utilize the storm water inside plant premises. It has been estimated that around 277200 m<sup>3</sup> of rain water at the project site will be available for groundwater recharge, ash handling system, green belt development etc.

### 3.4 Ecology

As per the modeling results, there will be no impact on forests falling within the study area due to gaseous emissions, if mitigative measures are taken as recommended in this report.

### 3.5 Noise Environment

Equivalent sound pressure level averaged over 8 hours. Leq (8 hrs) is used to describe exposure to noise in work places. In special cases, where noise levels may

exceed the acceptable limits, such as around the turbine, provision will be made of acoustic shield, if necessary.

All equipment in the proposed power plant will be selected /designed /operated to have a noise level below 85 to 90 dBA in line with the OSHA requirement. As per modeling results, the incremental noise levels due to the proposed plant will be in the range of 34 dB (A) to 41 dB (A) at a distance of 400 m from the source. Adequate noise control methods will be adopted.

### 3.6 Socio-Economic Environment

The proposed power plant will create mixed impact on the socio-economic environment due to:

- Change in occupation pattern.
- Migration of population from nearby areas for jobs.
- Marginal strain on existing infrastructure.

The positive impacts would consequently lead to an upliftment of the Quality of Life of the people in the area.

## 4.0 **Environmental Monitoring Program**

Environmental monitoring will be conducted on regular basis by VESPL to assess the pollution level in and around project area. This will help in assessing performance of pollution control equipment installed in the project and take mid term corrective measures, if any required. Portholes and sampling facilities will be provided.

The sampling and analysis of attributes including monitoring locations point sites will be as per the guidelines of the Central Pollution Control Board.

Environmental Management Cell will be established to supervise the monitoring programme. Budgetary provision for pollution control equipment cost of Rs. 20.85 crores has been made for implementation of Environmental Management Plan.

## 5.0 **Additional Studies**

### Risk Assessment

Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that exist in the plant. On the other hand, risk analysis deals with the identification and quantification of risks, the plant equipment and personnel are exposed to, due to accidents resulting from the hazards present in the plant. There will be a 25 KL storage tank for LDO. In case of fire in the LDO tank, the modeling results indicate that radiation intensity of  $37.5 \text{ kW/m}^2$  (i.e. 100% lethality) will occur within the radius 4.1m of pool fire.

Disaster Management Plan has been prepared to manage any disastrous event, if any, from the plant operation. Environmental and safety legislations will be kept in view while implementing the project.

Steam turbine & generator building	Moderate hazard potential	Fire and short circuit
Boiler	Moderate hazard potential	Fire / steam explosion
Coal Handling Plant	Moderate hazard potential	Fire or dust explosion
Coal storage	Moderate hazard potential	Spontaneous combustion
HFO / LDO storage	Major hazard potential	Fire

### Occupational Health and Safety

Effective implementation of measures suggested for pollution control will ensure safety and health of the workers.

## **6.0 Project Benefits**

The requirement of 60 skilled / unskilled persons will be met from nearby villages during construction phase in addition to some regular employment during operation. The project will help in generation of significant indirect employment. This will have positive socio-economic development in the region. There will be in general upliftment of standard of living of the people in the region.

## **7.0 Environmental Management Plan**

While implementing the project, the proponent will follow guidelines specified by CPCB under Corporate Responsibility for Environmental Protection (CREP) for thermal power plants. The following environmental management plan has been suggested during construction and operational phases.

### Construction Phase

The following control measures are recommended to mitigate the probable adverse impacts:

- Clear demarcation of sites for construction workers camp to prevent occupational hazards and ensure water supply, sanitary facilities, housing, domestic, fuel etc.
- Falling of matured trees should be avoided.
- Necessary precautions to be taken for LDO storage safety norms
- Vehicles at the project site should be properly maintained to minimize exhaust emissions as well as noise generation.
- Dust emissions arising out of the excavation, leveling, transportation and stockpiling activities should be controlled by water sprinkling.
- Noise prone activities should be restricted to daytime.
- Tree plantation should be started during the construction phase so that plantation grows to a considerable height by the time of commissioning of the proposed project.
- Surplus excavated soil, rubbish needs to be cleared once the construction work is over.

### Operational Phase

#### **7.1 Air Environment**

The following air pollution control measures have been recommended for implementation:



- 99.89% efficiency ESP should be provided to contain particulate matter emissions below 50 mg/Nm<sup>3</sup>.
- 110 m high stack will be for proper dispersion of gaseous emissions as per the guidelines of CPCB.
- Low NOx burner should be installed to keep NOx emissions well below the standards.
- Dust suppression / extraction system at the fuel handling area.
- Roads within the plant will be black topped.
- 30% of the entire project area will be developed as green belt using native plant species.

## 7.2 Noise Environment

Manufacturers and suppliers of machine/equipment like compressors, turbines and generators will be selected to ensure that these machine /equipment meet the desired noise/vibration standards by providing noise absorbing material for enclosures or using appropriate design / technology for fabricating/assembling machines. The operator's cabins (control rooms) should be properly (acoustically) insulated with special doors and observation windows. The operators working in the high-noise areas like compressor houses, blowers, generators, feed pumps, steam generation plant, turbo-generator area should use ear-muffs/ear-plugs. Plantation will further reduce noise impacts within the project premises.

The following measures are also recommended:

- Vehicles movement in the plant area will be regulated to avoid traffic congestion.
- Use of high pressure horn will be prohibited.

## 7.3 Water Environment

### ***Wastewater Management***

During plant operation, acidic and alkaline effluents will be generated periodically from the De-mineralization (DM) Plant and boiler blow down which will be collected in a neutralizing pit where the acidic and alkaline effluents will be neutralized with each other. This will be pumped and mixed with other effluents in the polishing pond after filtration. The treated effluent will be recycled.

The following additional measures are recommended:

- Oil / grease separator should be provided to skim oil / grease, if any, in the waste water.
- The sanitary waste should be discharged to septic tank and soak pit system.
- Induced draft cooling tower with COC of 5.
- Separate collection of storm water and development of rain water harvesting.

The project will operate on the principle of zero effluent discharge. The entire treated waste water will be recycled and reused for dust suppression, plantation, ash handling etc.



7.4 Land Environment

***Fly Ash Management***

Ash generated from plant should not be stored on land in open areas under any circumstances. The ash generated should be collected in dry form for storage in silos as temporary arrangement. Ash beyond the silos capacity should be disposed of in ash dike. The ash pond will be constructed with HDEP lining (1.5-mm) as per MoEF guidelines.

Fly ash will be utilized by VESPL for manufacturing fly ash bricks and fly ash aggregates. Also VESPL will motivate other entrepreneur to setting up fly ash brick plant surrounding the project area.

***Guidelines for Greenbelt Development***

A buffer between the sources of pollution and the surrounding areas will be developed by developing a 20 - 30m wide greenbelt along the plant premises. The green belt helps to capture the fugitive emissions and attenuate the noise apart from improving the aesthetics. Approximately 1500 trees per ha will be planted in consultation with the local Forest Department.

The choice of plants should include shrubs that grow 1 to 2 m high and trees of 3 to 5m heights. It should be ensured that the foliage area density in vertical is almost uniform by intermixing the trees and shrubs.

7.5 Socio-economic Environment

Following measures are suggested:

- Locally available workforce would be employed.
- The project authorities should communicate with the local community should be done on regular basis to provide an opportunity for discussion.
- Project authorities will organize regular environmental awareness programmes.
- Social welfare activities to be undertaken by the project authorities in collaboration with local administration, gram panchayat, block development office etc. for better co-ordination.
- Project authority will provide free medical facilities to villagers within the study area.



**FIGURE-1**  
**STUDY AREA (10 KM AROUND THE PROJECT SITE)**