Executive Summary

Introduction

Sarda Energy Limited (SEL) proposes to install 2x660 MW capacity coal fired thermal power plant near villages Baksara, Hedaspur and Kerakachhar of Janjgir-Champa District, Chhattisgarh State.

The Environmental Studies were carried out for the proposed power plant as per Terms of Reference (TOR) No. J-13012/70/2009-IA.II (T) dated: 2nd December, 2009 and revised TOR No. J-13012/70/2009-IA.II(T) Dated: 29th June, 2010, EIA Notification 2006, Ministry of Environment and Forests (MoEF).

1.0 Project Description

The land of 1444 acres has been identified in the region of village Baksara, Hedaspur and Kerakachhar, Block-Baloda in the district of Janjgir-Champa, Chhattisgarh state for the proposed power plant based on the criteria of availability of suitable land, minimum R & R issues, proximity to rail and road connectivity, as well as power evacuation facility, distance with respect to coal transport and availability of water. The salient features of the proposed project and site attributes are presented in the following table:

Name of the Project	2X660 MW Thermal Power Plant
Location of Project	
Villages	Baksara, Hedaspur and Kerakachhar
District & State	Janjgir-Champa, Chhattisgarh
Coordinates of the plant site	Latitude: 22^0 13' 50.92" to 22^0 15' 03.01" N Longitude: 82^0 36' 20.22" to 82^0 37' 51.81" E
General Climatic Conditions	
Maximum Temperature	47.2 ^{0}C
Minimum Temperature	3.6^{0}C
Annual Rainfall	1219 mm
Wind Pattern (during study period)	West
Elevation Above Mean Sea Level	280 MSL
Accessibility	
Road connectivity	The site is accessible by road from state highway connecting at Baloda.
Rail Connectivity	The nearest railway station of south eastern Railway is Champa /Naila which is around 33 km away from the site.
Historical / Important Places	
Archaeological/ Historically Important Site	None within 10 km distance from the proposed project site.
Sensitive Places	Hasdeo River (5.0 km) Dense mixed jungle (0.5 km)
Sanctuaries / National Parks	None within 10 km distance from the proposed project site.

Basic Requirement for the Proposed Project

The general characteristic of the 1444 acres area selected for the power plant is that the top soil mantle is alluvial soil followed by hard rock. The land use break-up for various units and facilities in the proposed power plant is based on the CEA Guidelines.

The coal which is the primary fuel for the power plant will be used 24000 TPD. M/s SEL has applied for grant of Long term coal Linkage from South Eastern Coalfield Limited for the proposed project. Coal will be supplied through rail system from the coal mines at Dipka and Gerva located at about 12 kms distance from the proposed plant site.

Coal with maximum of 46% ash with 0.8% sulphur content which will be fired in the boilers directly. The coal handling system will include a stack cum reclaimer and the system will consist of two streams of conveyors, one operating and one standby. The secondary fuel will be LDO conforming to IS: 1460. The fuel oil requirement is expected to be about 28.8m3/day.

Bulk of the intake water volume of 1, 08, 912 m^3/day will be required for make-up of condenser and auxiliary cooling. The cooling water blow down will be taken from the condenser outlet and will be utilized in the ash / coal handling systems and for horticulture and the excess if any will be led to the guard pond.

The effluent recycling / reuse system will be designed to maximize reuse of all the plant effluents and the plant will operate on zero discharge concept during dry season. The drains from the coal handling area (during rainy season) will be led to a sump. A sump pump would be provided to pump the water to the guard pond.

Plant drains from SG/TG area will be led to a sump which will also collect wastes from transformer area and fuel oil tank farm area. All the effluents from the sump are led to guard pond of 5,000m^3 capacity located within the plant premises. Suitable treatment will be provided to the effluent and same will be utilized for cleaning, dust suppression and development of greeneries.

Bottom ash removal from the bottom ash hopper would be carried out continuously at the rate of about 240 TPH using jet pumps.

The fly ash collected at the ESP hoppers would be gravity fed into individual transmitter vessels provided below each hopper. Afterwards, the conveying compressed air would be allowed to flow into the transmitter vessel by opening the air inlet valve. Once the desired conveying pressure is reached inside the vessel, the fly ash would be conveyed to the respective intermediate surge hopper (ISH) from where fly ash would be conveyed to the fly ash silo with the help of compressed air through transport piping.

2.0 Description of the Environment

The regional climatological data sourced from the IMD, Champa indicate that during summer season humidity varied between 8 and 84%. The mean Annual rainfall was 1219 mm. The minimum temperature was 13°C (Winter Season) and the maximum temperature was 42°C (Summer Season).

The baseline environmental quality for the Summer Season - 2010 was assessed in an area of 10 km radius around the proposed power plant.

Air Environment

During the study period, the maximum wind speed measured was 4m/s with the predominant directions from West.

The ambient air quality monitored at 10 locations selected based on predominant wind direction, sensitive areas, and human settlements indicated the following ranges for specified parameters:

- PM2.5 - 8.0-12.1 µg/m^3
- PM10 - 30.6 to 46.4 µg/m3.
- SO_2 - 4.6 to 12.5 µg/m3
- NO_x - 8.0 to 14.9 µg/m3.

The concentrations of PM2.5, PM10, SO_2 and NO_x were within the National Ambient Air Quality Standards for sensitive areas and a natural terrestrial environment free form these pollutants. The concentration of ozone was less than 19.5 µg/m^3 as against the standard limits of 100 µg/m^3 for 8 hourly average.

Noise Environment

The noise levels are primarily due to vehicular traffic and other anthropogenic activities. The minimum noise level 38.8 dB (A) was recorded at Hedaspur while the maximum noise level 54.1 dB (A) was recorded at Baksara. Thus the noise levels were within standard limits laid down for residential areas by CPCB. The relative high values of noise recorded in some rural and suburban areas were primarily due to vehicular traffic and other activities.

Water Environment

The water quality parameters investigated for the surface and ground waters of the study area indicated that the samples collected from the study area were found to be fit for human consumption, however the dissolved solids in most of ground water samples seem to be above desirable limit but well within the permissible limits. Most of the heavy metals in all samples were found to be below detectable limits.

Land Environment

The soil colour varied from grey to brown and the texture from sandy loam to sandy clay. Their electrical conductivity suggested suitability for good growth of plants. The nitrogen, phosphorous and potassium contents of these soils indicated that these soils are moderately fertile.

The land use pattern of the study area as per satellite imagery is presented in Table 3.14.

Flora & Fauna

Study area having patches of dense mixed jungle. Forest products are Sal seeds, Kokun, Lac, Tendu leaves, Karanj, Chiraunji etc. Both primary and secondary data are collected with respect to the project. There is no National Park or Wild Life Sanctuary within 25 km radial distance of mining lease area. There are no Schedule – I animals in the study area. The predominant wild life mammals of the study area include rabbit, jackal, fox, squirrel, bat, mongoose, etc.

Socio-economic Environment

There are 85 villages within the study area with total population of 80,291. The basic Infrastructural facilities such as educational, health, drinking water, post office and electricity are available in most of the villages.

Agriculture plays an important role in the rural economy in the study area even though the yield is not satisfactory. Therefore the people prefer to work as labour in nearby industrial area and also in construction projects. Livestock and related activities help in the improvement of economy of the area.

3.0 Anticipated Environmental Impacts & Mitigation Measures

During the Operation Phase of the power plant the environmental pollution will be due to concerns air emissions, water pollution, noise levels and solid waste generation.

Air Environment

Major sources of air pollution in a coal-based power plant are boilers, crushers and stockpiles. Fugitive dust emissions are also inevitable from raw material handling system as well as transportation sections. The pollutants of concern are therefore Particulate Matter, sulphur dioxide and oxides of nitrogen.

With the provision of ESP of high efficiency (99.88%) particulate emissions will be limited to 50 mg/Nm^3. Further, a 275 m height stack will be provided for adequate dispersal of SO_2. The emissions of NO_x will be controlled by using low NO_x burners.

The predictions using Industrial Source Complex AERMOD view Model indicated that the maximum incremental 24 hourly GLCs of PM, SO_2 and NO_X will be 0.18299, 11.722 and 6.593 $\mu g/m^3$ respectively at a distance of 9.0 km from the emission source towards East direction.

The predicted GLCs when superimposed on the baseline concentrations indicated that the air quality will be within the prescribed NAAQ Standards for residential areas in the post-project scenario.

The dust generated from coal handling plant will be insignificant because of handling takes place in closed circuit. For suppression of dust adequate water spray system will be provided. Adequate thickness of insulating material with proper fastening will be provided to control thermal pollution. Fugitive emissions from the ash pond will be controlled by maintaining water cover over the deposited ash. Green belt development and afforestation in the plant and surroundings of the ash disposal area will also help in minimizing the dust pollution.

Noise Environment

Noise generating sources in the power plant include rotating equipments, feed pumps, boiler and super heater safety valves, steam turbine, compressors etc. Noise control will be an integral part of the plant design. The equipments will have inbuilt noise control devices and the measured noise produced by any equipment will not exceed 85 dB(A) at a distance of 1 m from source in any direction. The noise produced in valves and piping will be attenuated to 75 dB(A) at a distance of 1 m from the source by using low noise trims, baffle plate silencers/line silencers, acoustic lagging (insulation), thick-walled pipe work etc. Noise proof cabins will be provided to operators wherever feasible.

The ambient noise levels in the region are between 38.8 and 54.1 dB (A) and are predicted to be within the permissible limits with the proposed mitigation measures even after commissioning of the power plant.

Water Environment

The water requirement for the proposed plant is about 1, 08,912 m^3/day, which will be met from Hasdeo river. The wastewater generated from different units of the power plant will be treated and stored in guard pond, which after treatment if required will be used for greenbelt development, suppression of the dust and recycling to cooling tower. The level of contaminants in cooling tower and boiler blow down will be minimized by operating at reduced cycles of concentration to minimize their build up. Thus, there will not be any effluent that will be released outside the project boundary.

The plant area will be designed with a network of drains to channel runoff during the rainy season. The surface water run-off from the coal stock yard will be led to a sump for settling and the overflow will be discharged to storm water drain after treatment if required to meet the effluent discharge norms. Zero discharge concept will be adopted in this power plant. Rainwater harvesting measures will be implemented to utilize the harvested water/ storm water inside plant premises.

Solid Waste

The main solid waste from the proposed power plant will be ash (fly ash and bottom ash), which will be generated at the rate of 11,040 T/d. The area identified for ash disposal will be for three months as per the latest Notification dated 3rd April 2007 on fly ash management. The unutilized fly ash accumulated during first three years (the difference between the generation and utilization target) will be utilized progressively at the earliest by M/s Sarda Energy Ltd.

To control fugitive dust emission from the ash pond area regular water layer will be maintained in order to prevent dust to be air born. After the ash pond is abandoned, its area will be reclaimed through tree plantation. The non-hazardous sludge generation from the guard pond, which would be small in quantity will be disposed in a landfill.

Ecology

There are only patches of dense mixed jungle located within 10 km radius of the study area. The area does not have any rare species of flora. The plant species found in the area includes Sal (Shorea robusta), Harra (Terminalia chebula), Mahua (Madhuca indica), Tendu (Diospyros melanoxylon) etc. There are no Schedule – I animals in the study area.

Socio-economic Environment

Rehabilitation and Resettlement of population involved is under process and will take into account the socioeconomic status of the area, homestead oustees, landless labourers etc.

The proposed project is expected to have several positive impacts on demography and socio-economic conditions by way of increase in employment opportunities leading to reduction in migration of locals for employment; growth in service sectors; improvement in prices of indigenous produced material and services benefiting local people; improvement in transport, communication, health and educational services etc.

4.0 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 will interact with Chhattisgarh Environment Conservation Board 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 power plant will have an in-house environmental laboratory for the routine monitoring of air, water, noise, and soil quality. For all non-routine analysis, the plant management may utilize the services of external laboratories.

Monitoring System:

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

- 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 for NO_x, SO_2 and Particulate Matter under 10 μ (PM 10).

Fire Fighting Arrangements

A Fire Hydrant system has been proposed to meet the norms, in addition to fire extinguishers at respective places wherever required.

- SEL strictly adheres to all fire protection and safety measures suggested by manufacturers
- Safety training will be provided to all the employees.
- No open fire is allowed and smoking will be strictly prohibited within the premises.
- Signboards will be displayed in restricted areas.
- The fuel storage yards will be isolated and maintained properly such that there is no chance of ignition.
- The electrical system will be designed with safety provisions like flameproof fittings in the vulnerable areas and also by providing isolated distribution system.
- SEL will provide fire-fighting equipments at various locations in the plant premises.

Environmental Budget

Sarda Energy Ltd. (SEL) has proposed to take adequate measures to mitigate all possible adverse impacts at the plant premises. SEL has earmarked an amount of Rs.626.93 Crores for the Environmental Protection and Corporate Social cost is Rs. 0.78 Crores for the proposed power plant.

5. Additional Studies

Risk Assessment & Environment Management Plan

Possible emergencies that can arise in the power plant due to operations, storages and handling of the fuels and gases, explosion in boilers, turbo generators, transformers and hydrogen plant; heavy leakage and subsequent fire in the fuel oil handling area and storage tanks; large fires involving the coal stockyard and coal handling areas; and accidental release of ash slurry; chlorine leakage in the water treatment plant etc. Out of these, the major fire and explosion hazards are due to storages of LDO, HFO and cylinders of hydrogen and chlorine.

The high intensity thermal radiation contours due to HFO and LDO storage tanks on fire would be confined to the plant premises. Hence, the effect of thermal radiation levels on general public outside the plant premises would be insignificant. To minimize the risk, the firewater cooling system and foam facilities will be provided as per OISD standard measures of safety requirements.

The threat zones due to the storage of hydrogen and chlorine cylinders would be within the plant premises.

- All standard measures of safety such as regular inspections of piping for damage and corrosion;
- Storages in a cool, dry, and well-ventilated area away from incompatible materials in tightly sealed containers;
- Labeling in accordance with OSHA's Hazard Communication Standard;
- Special training in safety to workers handling and operating chlorine containers, cylinders, and tank wagons;
- Approved storage cabinets, tanks, rooms and buildings to store cylinders will be taken.

All the instruments like pressure, temperature transmitters/gauges and alarms switches and safety interlocks will be tested for their intended application as per the preventive maintenance schedule. Similarly, the emergency shutdown system will be tested as per the preventive maintenance schedule.

Hydrocarbon, smoke and fire detectors will be suitably located and linked to fire fighting system in the vulnerable zones to reduce the response time and ensure safe dispersal of vapours before ignition can occur. Combustible materials will not be kept in storage and process areas as well as road tankers loading/unloading sites where there is maximum possibility of presence of flammable hydrocarbons.

Disaster Management Plan

The DMP will be designed to intercept full range of hazards specific 'to power plant such as fire, explosion, major spill etc. Emergency medical aids to those who might be affected by incident heat radiation flux, shock wave overpressures and toxic exposure will be inherent in the basic capabilities. The most important capability of this DMP will be the required speed of response to intercept a developing emergency in good time so that man made disasters are never allowed to happen.

Since the fire and explosion hazards in power plants mainly occur in the event of loss of containment, one of the key objectives of technology selection, project engineering, construction, commissioning and operation is "Total and Consistent Quality Assurance". The DMP will consist of “On-site Emergency Plan” and “Off-site Emergency Plan” and will be prepared in consonance with the guidelines laid by the MoEF.

6. Project Benefits

- Increase in employment opportunities and reduction in migrants to outside for employment.
- The project would provide direct employment.
- Increase in literacy rate.
- Growth in service sectors
- Improvement in socio cultural environment of the study area.
- Improvement in transport, communication, health and educational services.
- Increase in employment due to increased business, trade commerce and service sector.

7. Environmental Management Plan

The EMP will deal with various pollution control measures for mitigating environmental impacts identified during the construction and operation phases of the proposed power plant.

Construction Phase

Pollution control measures for mitigating environmental impacts identified during the construction phase are as under:

- Site for workers camp will be clearly demarcated and necessary basic needs and infrastructure facilities including water, sewage disposal, drainage and power will be provided to them.
- Safety norms for storage of the petroleum products at the construction site will be followed.
- Vehicles will be properly maintained and shall comply to the exhaust emission requirements.
- Accidental spill of oils from construction equipment and storage sites will be prevented.
- Noise prone activities will be restricted to the day time.
- Tree plantation will be undertaken during the construction phase so that they grow to reasonable height by the time of commissioning of the project
- On completion of construction, surplus of excavated material will be utilized for leveling and all surfaces will be reinstated.

- Preference will be given to local eligible people through both direct and indirect employment.
- The workers will be encouraged to allow their children to attend school.
- The safety department will supervise the safe working of the contractor and their employees.

Operational Phase

- Pollution control measures for mitigating environmental impacts identified during the operational phase of the power plant are as follows:
- Dust suppression / extraction system will be provided at the fuel handling area.
- Action plan for utilization of fly ash in brick making, cement manufacturing etc will be drawn and implemented.
- Stack of 275 m height will be provided for proper dispersion of emissions.
- High efficiency ESPs [99.88%] will be installed.
- Proven low NO_x burners will be used.
- Zero effluent discharge will be practiced by recycling and reuse of treated wastewater in ash handling, green belt development, dust suppression etc.
- Separate collection of storm water and development of rain water harvesting will be practiced.
- Roads within the plant will be asphalted.
- Workers working in high noise areas will be provided ear plugs / muffs.
- Vehicles movement in the plant area will be regulated to avoid traffic congestion.
- Use of high pressure horn will be prohibited.
- Greenbelt will be developed using native plant species in consultation with the local Forest Department.
- Periodic monitoring of designated environmental components will be conducted and the results used in identifying deviations if any to enable corrective measures if required.

Conclusion

The potential environmental, social and economic impacts have been assessed. The proposed power plant has certain level of marginal impacts on the local environment. With effective implementation of proposed environment management plan, these effects

will get marginalized. Implementation of the project has beneficial impact in terms of providing direct and indirect employment opportunities. This will be a positive socio-economic development in the region.