

EXECUTIVE SUMMARY

INTRODUCTION

Tamilnadu Electricity Board (TNEB) is a state Government Undertaking for Power Generation, Transmission, Distribution and Operation and maintenance of power plants. To meet the increasing demand for power supply in the sectors of agriculture, domestic, industrial and commercial purposes in Tamilnadu, TNEB has proposed to install coal based power plant of capacity 1 X 600 MW unit at Ennore Thermal Power station, Chennai.

Area Details

The proposed Power Project is located in Ernavur village, Chennai, Tamilnadu. The details of the area are mentioned below.

District/ State	Village / Taluka	Area	Ownership of Land
Thiruvallur / Tamilnadu	Ernavur / Ambattur	84 acres	TNEB

NEED OF THE PROJECT

Tamil Nadu is facing an increasingly growing demand for electricity as a result of the rapid population growth, urbanization and industrialization in the state. Currently the state depends on the central power sector and independent power producer for nearly 50% of its requirement. The installed generation capacity of Tamil Nadu is about 10,098 MW as on 31.03.2007

Even after the addition of the proposed one unit coal based Thermal plant of capacity 1X600 MW at ETPS Annexe, the power deficit will be 952 MW during the year 2011-2012. Hence the setting up of Coal based Ennore Thermal Power station at ETPS Annexe is justified to substantially offset the demand supply gap in Tamil Nadu in the 11th plan and beyond.

Details of Project Area

Details Of The Area	
District & State	Thiruvallur, Tamilnadu
Taluka	Ambattur
Village	Ernavur
Land Availability	84 acres
Topography of the Area	Barren land, low lying area
Topo sheet No	86 C/8
Latitude	13°12'02.87" N
Longitude	80°18'29.26" E
General Climatic Conditions (Climatological Table 1951 – 1980 of IMD, Madras)	
Daily Mean Maximum Temperature	32.9°C
Daily Mean Minimum Temperature	24.2°C
Annual Rainfall	1334 mm
Wind Pattern during study period	Predominantly from SE & SW
Elevation above mean sea level	+9.15 m MSL (graded level)
Accessibility	
Road Connectivity	The Proposed site is 20 km from Chennai city – Ennore highway road.
Rail Connectivity	Kathivakkam Railway Station (2 kms)
Seaport	Ennore Sea port (5 km)
Airport	Chennai – Meenambakkam(30 KM)
Historical / Important Places	
Archaeological/ Historically Important Site	None within 10 km radius of the site
Sensitive Places	None within 10 km radius of the site
Sanctuaries / National Parks	None within 10 km radius of the site

Site selection:

The proposed site of the power project was selected on the following criteria:-

- Availability of land within the existing complex of ETPS
- Availability of Coal through Ennore Port
- Availability of sea water
- Availability of infrastructural facilities/man power
- Road and Railway access.

Process Description of Thermal Power Generation

Coal received from the mines at (-) 100 mm size is crushed in the crusher house to (-) 20 mm size, which is further powdered in the coal mills. The powdered coal is burnt in the furnace to generate steam in the boiler. The steam generated in the boiler is expanded in the HP & LP turbines and power is generated in the generator. The steam after expansion in the turbine is condensed in the condenser and condensed steam is recycled back to the boiler.

Plant Process System

Plant process system will consists of Fuel Oil System, Chemical Dosing System, Compressed Air System, Air Conditioning System, Ventilation System, Instrumentation and Control System.

Instrumentation and control system consists of Events Recording System, Annunciation System, Water Sampling System, Power Supply System, Equipment Testing & Calibration System and Master Clock System.

BASELINE ENVIRONMENTAL SCENARIO:

Meteorological Condition

The predominant wind direction during the study period is from Southeast contribution to about 24.53% of time.

Predominant wind speeds were in the range of 3-5 kmph. Calm Conditions recorded were 12.53%. Calm Conditions recorded during daytime were 13.94%.

Ambient Air Quality

Nine ambient air quality-monitoring stations were selected in the study area. Three locations in core zone & upwind directions and six locations in Downwind & Crosswind direction were studied.

SPM

The minimum and maximum levels of SPM recorded in the study area and outside the plant boundary was 91 to 166 $\mu\text{g}/\text{m}^3$. The 98th percentile values are ranging between 130.6 to 164.2 $\mu\text{g}/\text{m}^3$

RPM

The minimum and maximum levels of RPM recorded in the study area and outside the plant boundary was 21.2 to 61.9 $\mu\text{g}/\text{m}^3$. The 98th percentile ranged between 44.2 $\mu\text{g}/\text{m}^3$ and 58.9 $\mu\text{g}/\text{m}^3$.

SO₂

The minimum and maximum level of SO₂ recorded within the study area was in the range of 6 to 15.6 $\mu\text{g}/\text{m}^3$. The 98th percentile values are ranging between 10.3 $\mu\text{g}/\text{m}^3$ and 15.2 $\mu\text{g}/\text{m}^3$.

NO_x

The minimum and maximum level of NO_x recorded within the study area was 9.6 to 17.2 µg/m³. 98th percentile values are ranging between 14.6 µg/m³ and 17.0 µg/m³

Water Sampling Locations and characteristics

Surface water samples were collected from five locations within the study area, analyzed and compared with IS: 2296 (surface water quality standards). Summary shows the pH values for all samples ranged between 6.2 and 7.8, TDS in up and down stream samples of the Koratliyar River are ranged between 5460 and 34220 mg/l, where as in sea and ash pond its concentration varies between 2811 to 19525 mg/l and 1210 to 2800 mg/l respectively. The Fluoride concentration, in the river samples were in the range of 0.08 to 1.60 mg/l.

Ground water samples were collected from seven locations analyzed and compared with IS: 10500 (Drinking water standards). pH values for all the samples ranged between 6.9 and 7.8, TDS are ranged between 390 and 2620 mg/l. Where as the concentration of chloride and TH in all the ground water samples observed between 178 to 255 mg/l and 270 to 1280 mg/l respectively. The Fluoride concentration, in the ground water samples were in the range of 0.50 to 1.10 mg/l.

Noise Levels

Ambient noise levels have been monitored at 10 locations within the study. Results are compared with prescribed standards of CPCB and were found to be within the limits.

Soil Quality

Soil samples were collected from four locations and analysis was carried out as per standards. pH values for all samples ranged between 7.16 and 7.56, the values of Electrical Conductivity ranged between 98 and 150 µmhos/cm. where as the range of N, P and K values are varies between 10 to 70 kg/ha, 9 to 21 kg/ha and 60 to 170 kg/ha respectively. Organic Carbon varies in between 0.08 and 0.38 %.

Ecology

Vegetation of the study area is broadly studied under two major groups:

- Scrub & Halophytic vegetation
- Mangrove vegetation

It is observed that the ecology of study area is influenced by marine habitat type. The existing species are well adapted to high salt tolerance and have some mechanism to conserve their body water. Due to intense interactions between land, sea and air productivity of natural system along the coastal area is very high. There is no reserved forest, national park and wild life sanctuary within study area. A list of common Avi fauna and Arthropods of study area are tabulated below:

Species observed during field study

Sl.No	Scientific Names	Common Names
Avi Fauna		
1.	<i>Corvus splendens</i>	House Crow
2.	<i>Adreyola grayii</i>	Paddy Bird/Pond Heron
3.	<i>Phalacrocorax pygmeus</i>	Little Cormorant
4.	<i>Phalacrocorax carbo</i>	Great Cormorant
5.	<i>Mycteria leucocephala</i>	Painted Storks
6.	<i>Recurvirostra avosetta</i>	Avocets
7.	<i>Passer domesticus</i>	House sparrow
8.	<i>Neophron percnopterus</i>	Scavenger vulture
9.	<i>Coracias benghalensis</i>	Blue Jay/ Indian Roller
Arthropods		
2	<i>Megascolex mauritia</i>	Earthworms
3	<i>Scolopendra sp.</i>	Centipedes
4	<i>Tulus sp.</i>	Millipedes
8	<i>Phyllium sp.</i>	Leaf insect
9	<i>Melanous</i>	Grass hopper
13	<i>Brachydentera sp.</i>	Ant

Socio Economic Environment

The study area consists of 11 villages and 3 towns. Total population of the study area is 3,24,379 with males comprising of 51.2% and females 48.7%. The male and female ratio of the study area is 950 females per every 1000 males

Land Use Pattern

Land use of the study area i.e. 10 km radius around the project site interpreted from satellite imagery. Land use of the study area pertaining to Forest, Irrigated, Un- irrigated, cultivable waste land, area N/A for cultivation, water bodies (sea +salt pan) and urban area was studied. Land use of the study area around the project site as per census 2001 is given below.

Land Use Pattern of the Study Area

S No.	Land use	Area (Ha)	%
1.	Forest	0.00	0.00
2.	Irrigated	1,544.00	6.29
3.	Un-irrigated	485.00	1.98
4.	Cultivable Waste land	745.00	3.04
5.	Area N/A for cultivation	2267.00	9.24
6.	Water bodies (Sea + salt pan)	12,901.20	52.59
7.	Urban Area	6591.60	26.87
Total		24,533.80	100.00

Seismicity

The study area falls under seismic zone III as per Seismic Zoning Map of India Meteorological Department.

ENVIRONMENTAL IMPACT ASSESSMENT

CONSTRUCTION PHASE

Air Emissions

Impacts during construction phase will be due to movement of equipment at site and dust emissions during the leveling, grading, earthwork, foundation works and other construction related activities, which will be mitigated by spraying of water. The impact generally confined within the project boundary and is expected to be negligible outside the plant boundary.

Water Quality

Impacts on Water Quality will be due to non – point discharges of sewage generated. Existing plant sanitation facilities (septic tanks) will be utilized for treatment and disposal of sanitary sewage generated by the work force.

Impact on Noise Levels

During Construction phase, noise will be generated due to Foundation works, construction activities and plant erection. However, these noises will be temporary and for short term only.

Impact on Ecology

There will not be any loss of trees, agriculture produce, timber yielding plants, etc. Therefore no major loss of biomass is envisaged during construction phase. Impact on flora and fauna will be insignificant.

Impact on Demography and Socio-economy

Impacts on Demography and Socio – economy would be due to Increase of floating population, Additional strain on civic amenities like road, transport, communication, drinking water, sanitation and other facilities to meet the work force requirement, Increase in demand of services includes hotels, lodges, public transport (including taxis), etc, Employment Opportunities for construction laborers, skilled and unskilled workers, local population, Economic upliftment of the area, Raising of House rents and land prices and increase in labor rates, Rapid growth of service sector will result in increase of incomes in the area, growth of the civil construction and transportation companies, Expanding of services like retail shops, banks, automobile workshops, school, health care, etc and Increase in literacy rates are anticipated.

OPERATION PHASE

Air Emissions

Particulate Matter

Source of particulate matter emissions will be from stack of the plant, due to vehicular emission and generation of dust from ground. Maximum predicted increase in Ground Level Concentration (GLC) of SPM will be in north direction having a value of $1.6 \mu\text{g}/\text{m}^3$.

Sulphur Dioxide

The following sources of Sulfur dioxide in the study area are identified: Emissions from existing coal fired power generating units, Emissions from domestic burning of fuel (coal, diesel, etc.) and vehicle movement. Maximum predicted increase in Ground Level Concentration (GLC) will be in north direction having a value of $29.6 \mu\text{g}/\text{m}^3$.

Oxides of Nitrogen

The following sources of oxides of nitrogen in the study area are identified. Emissions from industrial and domestic burning of coal, Emissions from automobiles Maximum predicted increase in Ground Level Concentration (GLC) will be in north direction having a value of $6.3 \mu\text{g}/\text{m}^3$.

Predicted GLC for Air emissions

The predicted overall scenario of pollutant concentration in the study area for SPM, SO_2 and NO_x are estimated to be $167.6 \mu\text{g}/\text{m}^3$, $45.2 \mu\text{g}/\text{m}^3$ and $21.9 \mu\text{g}/\text{m}^3$ respectively.

Water Environment

The effluents after treatment will be routed to guard before it is reused for greenbelt development and dust suppression purposes.

The estimated water requirement for proposed power plant is about 12000m³/hr or 2,88,000m³/day. Water drawn from the Bay of Bengal is subjected to pretreatment in a raw water clarifier and DM plant clarifier before distribution to various units. The total waste water generation is around 1,94,141 m³/day. It will be discharged in to Deep sea.

Impacts on Noise levels

Noise levels are mainly generated from coal mills, turbine, boilers, generators, pumps and cooling towers in the proposed power plant. Various equipments like Turbine, Generator, Boilers feed pump, Condensate, Coal mill, Cooling Tower and ID & FD Fans are designed to have noise level of 85 dB (A) at 1m distance. The predicted noise levels along the plant boundary due to various sources from the proposed expansion plant would be below 50 dB(A).

Impacts on Ash Generation

Bottom ash will be collected in hydrobins. Fly ash collected in the ESPs will be stored in the silos in dry form through Vacuum & Pressure system. The capacity of the Silos will be 24 hours generation. Ash generation from the use of domestic coal is expected to about 156 T/Hr (bottom ash 31 T/Hr + fly ash 125 T/Hr).

Impacts on Ecology

High efficiency ESPs are proposed to control particulate emissions. ETP with recycling arrangement is provided to control water pollution. Cooling towers are proposed to prevent thermal pollution. Adequate greenbelt will be developed. No additional land is required for plant. Hence impact on ecology will be limited.

Impact on Demography and Socio-economics

Impact on Demography and Socio-economics are envisaged due to increase in employment opportunities, increase in literacy rate, growth in service sectors, increase in consumer prices of indigenous produce and services, land prices etc., improvement in

socio cultural environment, improvement in transport, communication, health and educational services, Increase in employment due to increased business, trade commerce and service sector.

Impact on Health

Adequate air pollution, water and noise control measures will be provided in proposed expansion of power plant to conform to regulatory standards, so that impact on health is negligible.

ENVIRONMENTAL MANAGEMENT PLAN

The environment management plan (EMP) is required to ensure sustainable development in the area of the proposed power plant site. The management action plan aims at controlling pollution at the source level to the possible extent with the available and affordable technology followed by treatment measures before they are discharged.

CONSTRUCTION PHASE

Impacts during the construction phase on the environment would be basically of temporary nature and are expected to reduce gradually on completion of the construction activities

Site Preparation

Project site being flat terrain area, leveling may be required. Vegetation on topsoil will be removed prior to commencement of bulk earthwork. During dry weather conditions, dust may be generated by activities like excavation and transportation through un-metalled roads. The dust will be suppressed using water sprinkling.

Air Quality

Air emissions during construction phase will be due to dust and NO_x. The transport vehicles using petrol or diesel would be properly maintained to minimize gaseous pollution. Water Sprinkling is suggested to curtail the dust generation.

Water Quality

The sanitation facilities (septic tanks) of the existing unit will be used for the work force during construction phase. Hence, there will be minimal impact on groundwater.

Noise

To minimize the noise impacts the following recommendations would be implemented:
Provision for insulating caps and aids at the exit of noise source on the machinery;

The use of damping materials such as thin rubber/lead sheet for wrapping the workplaces like compressors, generator sheets;

Shock absorbing techniques would be adopted to reduce impact; Earmuffs would be provided to the workers and workers will be trained to use the protective gadgets regularly.

OPERATIONAL STAGE

Air Quality Management

Reduction Of Emission At Source

The following methods of abatement will be employed for the air pollution control.

Particulate matter will be controlled by providing highly efficient (99.89%) electrostatic precipitators (ESPs) to limit outlet concentration to 100 mg/Nm³. Chimney of 275-m height is proposed for adequate dispersion of sulfur dioxide; Emission of NO_x will be controlled through low NO_x burners; Adequate dust suppression system (water spray system) will be installed in the coal or ash handling system, transfer points; Green belt is provided around the plant boundary. Plantation will be taken up in the area not covered and along the internal roads; All the internal roads will be concreted/asphalted to reduce the fugitive dust due to vehicular movement; and Water spraying will be practiced frequently at coal stockyard. Further sufficient space will be provided for flue gas desulphurization (FGD) system if required at a later date.

Ambient Air Quality Monitoring

Stack Gas Monitoring

Auto stack monitoring instrument will be installed in the stack for monitoring of PM, SO₂, NO_x, HC and CO in the flue gas.

Ambient Air Quality Monitoring

5 permanent AAQ monitoring stations will be established in the study area for regular monitoring of SPM, RPM, SO₂, NO_x, HC & CO.

Water and Wastewater Quality Management

The total water requirement to the proposed expansion plant will be met from Sea Water. The consumptive water requirement for the proposed power plant is about 12000 m³/hour.

Monitoring of Water Consumption

Flow meters would be installed for all major water inlet and the flow rates would be continuously monitored. Periodic water audits would be conducted to explore the possibilities for minimization of water consumption.

Waste water Management

The total wastewater generation from the proposed power plant will be 1,49,141 m³/day which includes Clarifier & filter Plant Back wash, DM plant Regeneration Waste, Sanitary waste from plant toilets, Boiler Blow down, Cooling tower blow down, effluent from Oil handling area and coal handling area etc.

Domestic Sewage Treatment and Disposal

Sanitary sewage wastewater will be treated in sewage treatment plant (STP). The clarified effluent will be chlorinated in chlorine contact channel. Chlorine dosing tank will be provided near chlorine contact channel. After chlorination the treated effluent will be used for green belt development. The sludge from the bottom of the clarifier will be used as manure for the green belt or irrigation.

Final Disposal of the waste water & Monitoring of Waste Water Treatment

The treated effluent from the effluent tank will be used for horticulture and green belt development within the plant. The cooling water system blow-down would be drawn from cold cooling water system and discharged back to the sea, at distance of about 0.5km off the coast, with suitable diffuser and discharge structure at an appropriate location based on the bathymetry, marine ecology and re-circulation studies.

Storm Water Management

Storm water drainage system consists of well-designed network of open surface drains and rainwater harvesting pits along the drains so that all the storm water is efficiently drained off without any water logging.

Rain Water Harvesting System

The collected rain water shall be utilized for power plant to optimize the raw water requirement. The excess rain water may be discharged to the nearest surface water body through dedicated storm water drain. The surface water run-off from the main plant area would be led to a sump for settling and the over flow would be collected in the common water basin for further uses in the power plant

Greenbelt Development

Out of 84 Acres of land, green belt will be developed in 20 acres. It is proposed to cover an area of 20 - 50 m all round the proposed unit. Apart from the bulk plantation around

the boundaries, Roadside avenue plantations will also be taken up. Based on the agro-climatic conditions of the region, location of the proposed power plant, physico-bio-chemical properties of the soil strata, nature of the pollutants and their rate of dispersion, it is suggested to develop greenbelt around the plant

ENVIRONMENTAL MONITORING AND FISCAL ESTIMATES

Environmental Cell will be formed to manage environmental aspects during operation phase.

Environmental Management Cost

Total environmental cost is envisaged to be Rs. 232.00 Crores and recurring cost is envisaged to be Rs.16.00 Crores. Monitoring schedule and parameters for monitoring are proposed during operation phase.

RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

Preventive Maintenance

Routine inspection and preventive maintenance of equipment/facilities at the unit.

Risk Mitigation Measures

The materials handled at the proposed installation are inflammable and reactive substances and based on the consequence analysis; the following measures are suggested as risk mitigation measures.

- The storage area, process area as well as road tankers loading/unloading areas where there is maximum possibility of presence of flammable hydrocarbons in large quantities, it should be ensured that combustible materials are not placed here such as oil filled cloth, wooden supports, oil buckets etc. to reduce the probability of secondary fires in case of release.
- Hydrocarbon, smoke and fire detectors should be suitably located and linked to fire fighting system to reduce the response time and ensure safe dispersal of vapours before ignition can occur.
- Tank fires result in little damage at ground levels. Damage at tank height is such as to damage adjacent tanks. Hence tank cooling provisions, particularly upper sections of the tank must be ensured to prevent explosion. Foam for arresting roof fires must be started immediately.

- Pool fires resulting from tanker/pump/pipeline leakage are dangerous since the liquid pool becomes unconfined. Training in fire fighting, escape action, operation of emergency switches etc. is vital.
- Pump loading line failures have also a possibility of causing major damage. Strict inspection, maintenance and operation procedures are essential for preventing escalation of such incidents.
- Emergency procedures should be well rehearsed and state of readiness to be achieved.

CONCLUSION

The proposed project is indispensable in view of the forecasted energy shortage. The impact on the social environment is positive giving job and business opportunities to local people and there will be substantial taxes and revenues from the project. Thus, the proposed project will help in accelerating socioeconomic growth, and improving quality of life. TNEB will apply all measures stated in the REIA to prevent, mitigate, and deal with impacts related to construction and operation of proposed 600 MW power plant.

TNEB proposes to provide certain need based socio economic measures to the local people living in and around the proposed plant site.

Summing up, the project is a positive contribution to local area, the region, and the country.