



# Executive Summary

## 1.0 Introduction

Tamil Nadu Generation and Distribution Corporation (TANGEDCO), proposes to set up a 1x660 MW coal based Supercritical Ennore Thermal Power Station (ETPS) Expansion Project within the existing ETPS complex located near Ernavur village, Tiruvottiyur taluk, Thiruvallur district of Tamil Nadu state.

Proposed plant consists of Coal Fired Boiler, Steam Turbine Generator Units and Balanced of Plant (BOP) Units. Based on proposed capacity, project is supposed to fall under category A of Project Activity 1(d), Thermal Power Plants ( $\geq 500$  MW coal/ lignite/ naptha & gas based) under the schedule as per EIA notification issued on 14th September, 2006. In order to assess likely impacts from proposed project on the surrounding environment and evaluating means of alleviating likely negative impacts, if any, from proposed project, TANGEDCO has retained Ramky Enviro Services Private limited (RESPL) as their environmental consultant.

Environment clearance for ETPS expansion project was accorded by MoEF&CC 03/06/2009 and extended for a period of 5 years on 08/09/2014(till 02/06/2019). CRZ clearance for coal conveyor intake and treated effluent outfall waterlines accorded on 23/12/2008 and validity extended up to 22/12/2018 on 31/3/2014. However, project could not be constructed within the validity period. Accordingly present proposal is submitted for obtaining fresh environmental clearance. The proposal was considered by Re- constituted Expert Appraisal Committee (Thermal Power) in its 23rd meeting held on 30th November, 2018 for determination of the Terms of Reference (ToR) for undertaking detailed EIA Study in accordance with the provisions of the EIA notification. The EAC has issued ToR vide its Letter No. F. No. J-13012/15/2018- IA. I (T) dated: 21st January 2019. Report has been prepared as per the recommendations of ToR.

ToR amendment issued vide its letter No. F. No. J-13012/15/2018- IA. I (T) dt:1.5.2019 for the following:

- (a) Base line data collected during July-September 2018 can be used in preparation of EIA/EMP report and collecting 104 readings a year may also be exempted.
- (b) Examination of alternate sites may also be exempted as it is ongoing project and environmental clearance had already been issued for the project.

MoEF&CC-New Delhi have exempted conducting fresh Public hearing for the captioned project vide letter dt.10.7.2019

Proposed expansion project is located adjacent to the proposed replacement project (capacity 1 X660 MW) within the existing ETPS complex. The project site is located near Ernavur village, Tiruvottiyur taluk, Thiruvallur district of Tamil Nadu state. The site is located at latitude of 13° 11' 30" to 13° 12' 04" N and longitude of 80° 18' 14"E to 80° 18' 30"E.



Project boundary is at a distance of about 70 m, 575 m and 815 m from Ennore back waters, Korattaliyar river and Bay of Bengal respectively. Project site is about 600 m, 1.2 km, 5 km & 20 km from Manali Highway, Ernavur village, Ennore port and Chennai city respectively.

## **2.0 Project requirements**

### **2.1 Land requirement**

The proposed plant will be constructed in 90 acres of land which includes vacant land of 84 acres within the existing ETPS complex (plant boundary) and 6 acres for corridor of pipeline and conveyor system (outside the plant boundary). In comparison to CEA guidelines the land required for similar capacity power plant (Coastal station based on imported coal with conveyor and Natural Draft Cooling Towers (NDCT) cooling towers) is about 135 acres which are well within the limits in terms of area utilization. There is no additional land acquisition and no rehabilitation or resettlement issues involved for the project.

### **2.2 Fuel requirement**

Project is based on 100% imported coal supplied by M/s. MMTC limited. Coal is brought to Ennore Port by ship and further transported to project site by pipe conveyor. Boiler fuel (coal) consumption is 263 TPH and quantity of coal required is 2.0 Million tons /annum. Calorific value of imported coal is around 5805 Kcal/kg, ash & Sulphur content is 6.62% & 0.53% respectively. Support fuel used is Heavy Furnace Oil (HFO)/ Light Diesel Oil (LDO) supplied by nearby refinery at Chennai. Quantity of support fuel required is 5782 KL/ annum.

### **2.3 Water requirement**

Total water required for project is about 7113 m<sup>3</sup>/hr. Source of water is Bay of Bengal with intake point about 650 m from shore line. Major water requirement is for cooling water make-up 5700 m<sup>3</sup>/hr and Reverse Osmosis Plant (RO) 1413 m<sup>3</sup>/hr. Water required during construction phase is 200 m<sup>3</sup>/day, which is supplied by CMWSSB and stored in underground water tank. No groundwater will be used during construction or operation phases of project.

### **2.4 Process description**

Proposed plant will use supercritical plant (SCP) technology with boilers designed to take imported coal. Coal received is crushed in the crusher house to bring down the size to - 20mm, which is subsequently pulverized in the coal mill. The powdered coal is burnt in the furnace to generate steam in the boiler. The steam generated will be semi outdoor, once through, radiant reheat, dry bottom and balanced draft unit of super-critical parameters, designed for firing pulverized coal as primary fuel. Steam generated will be sized for 2100 TPH at 256 kg/cm<sup>2</sup> (a), super-heated outlet pressure, 568 °C steam SH temperature and 593°C reheat temperature. The generators will be directly coupled, horizontal shaft cylindrical rotor continuously rated at rated power factor of 0.85 lagging, 3 phase 50 Hz.

Steam after expansion in turbine is condensed in condenser (Cooling tower type: NDCT) and condensed steam is circulated back to the boiler. Hot gasses from furnace after losing heat



in different areas go through Electrostatic Precipitators (ESPs) with efficiency of 99.98%, where ash is collected. The clean gas goes through 275 m chimney. Flue gas desulphurization (FGD) with efficiency of 95% is used for controlling sulphur dioxide emission and Advanced combustion technology with low NO<sub>x</sub> burners.

### 3.0 Baseline environmental status

Field investigations were undertaken for collecting existing baseline data for Land Use Land Cover (LULC) Air, Water, Noise, Soil, Ecological and Socio-economic conditions. A study area of 10 Km radius from project site is identified to establish present environmental conditions for above environmental components. The main aim of the EIA study is to identify critical environmental attributes affected and their adverse impacts on surrounding environment due to the proposed. The field data generation was undertaken as detailed below

- Ambient air quality (AAQ) monitoring during July to September 2018.
- LULC, Water, Noise, Soil, Ecological and Socio-economic conditions April- May 2019.

#### 3.1 Land Use Land Cover (LULC)

LULC features of the study area was collected by analyzing Survey of India topo sheets, Satellite imageries supplied by NRSC and Ground validation for interpretation of False Color Composite (FCC) imageries through site visits. The land use pattern of study area mainly falls under following categories Sea: 43%; Built-up: 29%; Agriculture 8%; In-land water bodies: 7%; Waste land 12%; Others 1% and Forest: 0 %.

#### 3.2 Meteorology (Climate)

Metrological data is collected from nearest IMD station at Chennai and also at project site with the help of weather station. The pre dominant wind direction recorded is from South West (SW) closely followed by West South West (WSW). Calm conditions prevailed for 2.38% of the total time. Average wind speed observed for the season is around 2.85 m/s.

#### 3.3 Ambient Air Quality

AAQ was monitored at 9 locations within study area. Monitoring locations were identified in downwind, cross & up wind directions. Air pollutants monitored are Particulate Matter (PM<sub>2.5</sub> & PM<sub>10</sub>), Sulphur dioxide(SO<sub>2</sub>), Oxides of nitrogen ( NO<sub>x</sub>), Ozone, Carbon Monoxide as per standard MoEF&CC guidelines and results compared with NAAQ 2009 CPCB Standards.

The minimum and maximum 24hr concentration of PM<sub>2.5</sub> recorded is in the range of 35.6 to 58.4 µg/m<sup>3</sup> against a standard of 60 µg/m<sup>3</sup> whereas the PM<sub>10</sub> values are in the range of 74.8 to 98.5 µg/m<sup>3</sup> against a standard of 100 µg/m<sup>3</sup>. The maximum Particulate Matter values are just within the Standards. The SO<sub>2</sub> and NO<sub>x</sub> 24 hr concentrations observed are in the range of 12.1 to 26.5 µg/m<sup>3</sup> and 20.8 to 38.5 µg/m<sup>3</sup> respectively against a standard of 80 µg/m<sup>3</sup>. Maximum SO<sub>2</sub> & NO<sub>x</sub> values are found to be well within the NAAQ 2009 CPCB Standards. Ozone 1 hr concentration values are in range of 7.6 to 22.4µg/m<sup>3</sup> against a standard of 180 µg/m<sup>3</sup>, whereas CO levels are found to be below detectable limits.



### 3.4 Water quality monitoring

Ground water 10 samples and surface water 3 samples were collected from different sources and analyzed for all important physico-chemical and biological parameters to establish quality of water prevailing in the study area. Ground water samples were collated from open well, hand pumps & bore wells. Surface water collected from Kosasthalaiyar river near bridge at Vichoor village, Buckingham channel and sea water near Ennor beach.

**Ground water samples:** The pH values are in the range of 7.0 to 7.8; TDS levels between 462 to 2545 mg/l (samples from Ennore & Vallur village are above permissible limit); Chloride concentrations between 120 to 762 mg/l; hardness observed is 295 to 983 mg/l (samples from Site, Ponniamman nagar and Vallur village are above permissible limit); Fluoride concentrations between 0.5 to 1.5 mg/l. Except for samples from Project site, Ennore, Ponniamman nagar and Vallur village other samples values are within permissible limits of 10500: 2102 Dirking water-specifications and fit for drinking use purpose.

**Surface water sample:** (Kosasthalaiyar river near bridge at Vichoor village): The pH values is 6.9; TDS is 1850 mg/l; Chloride concentrations is 604 mg/l; hardness observed is 413 mg/l; Fluoride concentrations is 1.5 mg/l; DO: 3.4 mg/l and BOD: 18 mg/l. Sample analysis indicates water is suitable for Irrigation, Industrial cooling, Controlled Waste disposal based as per "CPCB Water Quality Criteria Designated-Best-Use updated 11<sup>th</sup> Sep 2017". The other 2 surface water samples collected are sea water.

### 3.7 Noise monitoring

Noise was monitored at 10 locations within the study area of the project site. The locations were identified for assessment of existing noise level status( keeping in view of the land use pattern, residential areas in villages, schools, bus stands, etc (Industrial: 2 no; Commercial: 2 no; Residential: 4 no; Silent: 2 no). Day equivalent noise levels (dB (A)) are in the range for Industrial area 57.6 to 62.4; Commercial area is 55.7 to 62.2; Residential area is 53.8 to 54.8; Silence zone is 49.8 to 49.9 whereas in night noise levels are in the range for Industrial area 44.1 to 45.3; Commercial area is 43.8 to 44.7; Residential area is 42.8 to 43.5; Silence zone is 39.8 to 39.9. Noise values in the study area are within the Noise Pollution Rules 2000.

### 3.8 Traffic survey

Traffic survey was carried out at 2 locations (Ernavur village road & New Manali Express Road). Ernavur village road is a 2 lane 2 way road with 7 m width. Traffic volume recorded were 406 to 702 PCU/H. As per IRC guidelines Level of Service of this road falls under category "C" (Acceptable level of driving comfort, some delays). New Manali Express Road is a 4 lane divided 2 way road. Traffic volumes recorded are 1355 to 3473 PCU / H. As per IRC guidelines Level of service of this road falls under category "E" (High level of driving frustration, high levels of delays).



### **3.9 Soil quality**

Soil Quality was monitored at 9 locations within the study area. The locations were selected to assess the existing soil conditions representing various land use conditions and geological features. The important physical, chemical parameter concentrations were determined and compared with Standards of Indian Council of Agriculture Research, New Delhi.

The pH values of samples in the study area are varying from 6.9 to 8.4 falling under normal to saline, the electrical conductivity is varying from 111 to 387  $\mu\text{mhos/cm}$ , the organic carbon is varying from 0.18 to 0.54% falling under low & medium category, the available nitrogen is varying from 45.4 to 78.3 kg/ha falling under low category, the available phosphorus is varying from 4.01 to 22.8 kg/ha falling under low(3) & medium category(6), and the available potassium is varying between 65.5 to 256 kg/ha falling under low(3) & medium(6) category. NPK values of soil samples collected are in low to medium category indicating need for fertilizers with high NPK values for agriculture and horticulture activities

### **3.10 Ecological environment**

A detailed analysis was done in the study area which includes compilation of secondary data from published literature of Forest Division and Primary data generation through systematic studies. Primary data was collected through visual observation of species in the study area.

There are no National Parks, Wildlife Sanctuaries, Biosphere Reserves and Important Bird Areas (IBA) within study area. There are no reports of occurrence of any rare or endangered or endemic or threatened (REET) fauna in study area. None of species reported or recorded from the study area are placed in Schedule I of the Indian Wildlife (Protection) Act, 1972.

### **3.11 Socio-Economic environment**

Total population in study area is 433177 people with sex ratio of 986. In study area 0.45%, 21.35% and 15.98% belong to ST, SC & socially weaker section respectively. Main workers, marginal workers constitute 32 & 6% respectively. Most of villager surveyed are benefited by government schemes and are aware of welfare schemes and programs of government. Youth in area are devoid of employment opportunities and are potential source of workers.

## **4.0 Anticipated environmental impacts and mitigation measures**

### **4.1 Impacts during construction phase**

The possible construction activities that contribute to the environmental impacts are:

- Dust generation during leveling of earth, movement of vehicles on unpaved roads, unloading of raw materials and removal of unwanted waste material from site
- Emission of pollutants from vehicular exhaust
- Accumulation of excavated earth material

Impacts due to above activities would be temporary and confined within project boundary

### **4.2 Impacts during operation phase**



#### 4.2.1 Impact on air quality

Plant utilizes 100% imported coal. Major source of pollution are flue gas emissions from stack (Dust particulates, SO<sub>2</sub> and NO<sub>x</sub>) and fugitive dust emissions from coal handling & material transfer points, fly ash dust particles from ash silos, ash disposal area and fly ash vented out during the unloading of fly ash from ESP hoppers to silos.

GLC of air pollutants released from 275 m height stake were estimated using study state dispersion model based on Gaussian Plume (AERMOD Version 7.0.3) software. The emission rates in stack estimated for PM, SO<sub>2</sub> and NO<sub>x</sub> without control measures are 3875 g/s, 776 g/s and 172 g/s respectively. Whereas emission rates in stack for PM, SO<sub>2</sub> and NO<sub>x</sub> with ESP (99.98% efficiency), FGD (95% efficiency) and Advanced combustion technology with low NO<sub>x</sub> burners are 0.78 g/s, 39 g/s and 62.6 g/s respectively.

Without control measures result of dispersion modeling shows increase in maximum GLC for PM is 745 µg/m<sup>3</sup>, SO<sub>2</sub> is 14.1 µg/m<sup>3</sup> and NO<sub>x</sub> is 3.2 µg/m<sup>3</sup>. With Control Measures result of dispersion modeling reveals a likely increase in maximum GLC for PM is 0.02 µg/m<sup>3</sup>, for SO<sub>2</sub> is 0.75 µg/m<sup>3</sup> and for NO<sub>x</sub> is 1.2 µg/m<sup>3</sup>. From above value we can see installation of control equipment helps in considerably reducing GLC values. Overall concentration (with control equipment) including existing baseline status for PM is 98.52 µg/m<sup>3</sup>, SO<sub>2</sub> is 27.25 µg/m<sup>3</sup> and NO<sub>x</sub> is 39.7 µg/m<sup>3</sup>. These values are within NAAQ standards 2009. Proposed mitigation measures are

- Dust suppression/extraction facilities will be provided to mitigate the dust generated at coal transfer points and coal stockyard.
- Dust collection system will be provided in coal bunkers to evacuate dust and hazardous gases like methane from the coal bunkers.
- To reduce the dust nuisance while loading the ash into the trucks from fly ash silos, the fly ash would be conditioned with water spray
- To control SPM, SO<sub>2</sub> and NO<sub>x</sub> in flue gas, ESP with 99.98%, efficiency, FGD with 95% efficiency and Advanced combustion technology with low NO<sub>x</sub> burners will be provided.

#### 4.2.2 Impact on water quality

Total waste water of 5140 m<sup>3</sup>/h is generated from Cooling tower blow down 4114 m<sup>3</sup>/h, Clarifier rejects 88 m<sup>3</sup>/h, RO1 reject 928 m<sup>3</sup>/h, Neutralization pit 10 m<sup>3</sup>/h. Waste water is discharged into sea through pipeline meeting discharge standards of maximum temperature not more than 5° and salinity not exceed 50 PPT wrt to ambient seawater at release point.

Waste water from RO2 rejects 22 m<sup>3</sup>/h will be reused for dust suppression, CHP dry fogging etc. Domestic waste water will be treated in the Sewage Treatment Plant of capacity 250 KLD and used for green belt development and Ash handling.



#### 4.2.3 Impact on noise levels

The major sources of noise generation within plant are crusher unit; induced draft & forced draft fans; boiler feed pumps; turbines; generators; cooling towers; vehicular movement. The proposed mitigation measures are

- Properly designed plant and machinery (i.e. by providing inbuilt mechanisms like silencers, mufflers, and enclosures for noise generating parts) and shock absorbing pads at the foundation of vibrating equipment will be provided.
- In high noise intensity working areas/zones ear muffs or ear plugs or any other suitable personal protective equipment would be provided to the workmen.
- Development of greenbelt around plant boundary will diffuse noise pollution.
- Provision of isolation for major noise generating equipment's.
- Regular noise monitoring carried out for taking corrective action, wherever required.
- Restricted vehicular movement, drivers informed to blow horns only when required.
- Periodical medical examination on hearing loss shall be carried out for all the workers and maintain audiometric record and for treatment of any hearing loss including rotating to non-noisy/ less noisy areas.

#### 4.2.4 Solid and hazardous wastes

Plant, being coal-fired, would generate coarse (bottom ash) & fly ash of about 84 & 336 TPD. Ash Management Plan will be developed for 100% utilization of fly ash (will be sent to needy vendors on e-auction basis) within time period prescribed by MoEF&CC. The unused ash, till such time, would be disposed in the existing ash pond.

Sludge generated from oil storage tank will be collected, stored in a safe and covered place to be disposed as per CPCB/SPCB/Hazardous wastes rules. Used oil from Lube oil & Transformer will be sold to authorized re-processor registered with CPCB.

#### 4.2.5 Emergency preparedness plan in case of natural or in plant emergencies

To handle consequences of a major emergency inside factory or immediate vicinity of plant, a detailed disaster management plan is formulated. Emergency control center will be set up with emergency response team and communication system. It is essential that emergency plan be regularly tested to identify and correct any defect by keeping plan up to date.

#### 4.2.6 Occupational health measures

Plant will be equipped with a full-fledged Occupational Health Centre (OHC) within plant premises as mandated under the Factories Act, 1948. As part of surveillance program, following minimum medical examination will be undertaken during pre-employment phase: General physical examination and blood pressure, X-Ray of chest & ECG, Sputum examination, detailed routine blood & urine examination, Audiometry and Spirometer. As part of routine & annual medical examination on people working in high noise levels, stress and dust exposure areas, a comprehensive surveillance program will be adopted.



## 5.0 Environmental management plan

Environmental Management Plan (EMP) is required to ensure a sustainable development of plant and surrounding areas. EMP will be integrated in all major activities of the project, with clearly defined policies, to ensure ecological balance of area is maintained and adverse effects are minimized. EMP requires multi-disciplinary approach with mitigation, management, monitoring and institutional measures taken during implementation and operation phases, to eliminate adverse impacts or reduce them to acceptable levels.

The mitigation measures are planned for construction and operation phases and the overall management plan helps to improve the supportive capacity of the receiving bodies. The EMP aims to control pollution at the source level to the possible extent with the available and affordable technology followed by the standard treatments before getting discharged. The recommended mitigation measures will synchronize the economic development of the study area with the environmental protection of the region.

### Project Cost estimates

- Project Cost (Estimated) : Rs. 5421.38 crores (Rs 8.21 crores/MW)
- EMP (Capital Cost) : Rs. 977 crores
- EMP (Recurring expenditure) : Rs. 98 crores
- CER Cost : Rs. 13.65 crores

## 6.0 Environmental monitoring program

Environmental Monitoring Program is designed for assessing efficiency of implementation of Environment Management Plan (EMP) and to take corrective measures in case of any degradation in surrounding environment. Different activities involved in proposed project (during construction and operation phases) and their impact on various environmental attributes is taken into account for designing a detailed environmental monitoring program.

Implementation of EMP and periodic monitoring is proposed to be carried out at plant level and area level for the proposed thermal power plant and allied activities like coal handling facilities, workshop, colony, etc. A comprehensive monitoring mechanism shall be devised for monitoring of impacts due to proposed project as a part of compliance to CTE/CTO.

Plant level environmental protection measures like dust suppression, treatment and recycling of wastewater, plantation and noise control in the plant premises, housekeeping, implementation of EMP and Environmental Clearance conditions will be monitored by the plant authorities in accordance with compliance to EC/CTE/CTO.

## 7.0 Project benefits

Contribution of the plant on local social infrastructure is expected to be significant by stimulating growth of industrial and commercial activities in and around the district, by improving availability of the power. This project will provide a significant amount of direct





and indirect employment opportunities to the local people with different skills and trades. Infrastructure & socio-economic status of surrounding areas will be benefited as follows:

- Improvement in education, housing, banking, postal & communication services
- Improvement in power supply, water supply and sanitation
- Improvement in economic conditions and Recreation facilities
- Training will be given to local people to improve employment potential
- Increase in revenue to state from taxes & duties from development of local businesses

## **8.0 Conclusions**

EIA study made an overall assessment of potential environmental impacts due to proposed plant and proposed mitigative measures to eliminate adverse environmental impacts or reduce them to acceptable levels as part of the EMP.

The demand for electricity has been steadily increasing. Setting up of Power Plant in this area will benefit society by providing better infrastructural, educational, medical facilities, improvement in indirect employment and economic growth of the area.