

Executive Summary of the EIA Report

for 3600 MW Thermal Power Plant, Captive Port
and Desalination Plant at
Cuddalore District, Tamil Nadu

Prepared for
IL&FS Tamil Nadu Power Company Limited
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EXECUTIVE SUMMARY

1. INTRODUCTION

IL&FS Tamil Nadu Power Company Limited (ITPCL) – a group company of Infrastructure Leasing and Financial Services Limited (IL&FS), one of the largest infrastructure financing and project development companies in India is contemplating on setting up an imported coal-based thermal power plant of 3600 MW capacity (2x600MW Sub Critical Technology and 3x800MW Super Critical technology) at Cuddalore District, Tamil Nadu. In order to handle the coal requirements for the proposed power plant, a captive port with enabling infrastructure to support the import 15 MTPA coal along with other plants and machinery is proposed. The project also includes a desalination plant of 30 MLD capacity to meet the fresh water requirements. GoTN has in-principle approved the ITPCL's proposal to set up a power project of 4000 MW capacity.

2. LOCATION AND DESCRIPTION OF SITE ENVIRONMENT

The proposed thermal power plant, desalination plant and captive port are located at coastal side of Kothattai, Ariyaghosti, Villiyanallur and Silambimangalam revenue villages in Parangipettai block of Cuddalore District, Tamil Nadu.

3. NEED FOR THE PROJECT

Thermal Power Plant

The power demand in the country is on the rise due to rapid economic and industrial growth warranting extensive infrastructure developments. As per the national electricity plan, the energy demand is likely to increase by 35.6% in 2011-12 from its 2006-07 value and by another 35.2% in 2016-17. The capacity addition at the present rate will not be able to meet the projected demand and would result in a huge power deficit. To mitigate the gap between demand and supply, the Government of India (GoI) is facilitating large scale capacity additions at shorter time through public private partnership. GoTN has approved the setting up of merchant power plants in Tamil Nadu with a total generating capacity of 16,000 MW and is in the process of permitting up to 30,000 MW of capacity addition on merchant basis.

GoTN has approved ITPCL's proposal to establish a thermal power plant up to 4000 MW capacity, availing of which ITPCL now proposes the set up of a 3600 MW plant. ITPCL, a group company of IL&FS with its years of experience in development of power projects, now proposes to set up a thermal power plant at Cuddalore District in line with the vision of the GoTN. The proposed thermal power plant will contribute towards bridging the power supply and demand gap at regional as well as national level. Thus the proposed thermal power project is fully justified for implementation at the earliest possible.

Captive port

The proposed 3600 MW thermal power plant requires about 15 MTPA of imported coal. In order to handle the huge quantity of coal for the power plant, ITPCL intends to set up a captive port in the vicinity of the thermal power plant as an environmentally compatible, socially viable and an economically sustainable option.

Captive desalination plant

In order to meet the water requirements of thermal power plant and captive port, it is proposed to develop a captive desalination plant of 30 MLD capacity. This will avoid tapping of groundwater in the region and also dependence on Tamil Nadu Water Supply and Drainage Board (TWAD) for fresh water supply to plant. Only 0.5 MLD of fresh water is requested from TWAD to meet the requirement during the construction period.

4. PROJECT DESCRIPTION

The project has three major components/sub-projects viz., the thermal power plant, captive port and desalination plant. The specific details of the project are provided in the following sections.

4.1 Thermal Power Plant

The 3600 MW thermal power plant planned with

- Fuel - Coal sourced from Indonesia (about 15.0 MTPA) superior due to its lowest sulphur content.
- Technology – Sub Critical technology (600 MW units 2 in no.) and Super critical technology (800 MW units 3 in no.)

The coal-based thermal power plant comprising of following units:

- Steam generator
- Steam turbine
- Coal handling system
- Ash handling system
- Condenser
- ESP
- Power plant stack (2X275 m Height)
- Fuel system
- Utilities and services
- Sea water intake/outfall system

4.2 Captive Port

In order to meet the coal requirements for the proposed power plant, a captive port with enabling infrastructure for import of about 15.0 MTPA coal along with other plants and machinery is proposed.

The details of the captive port facilities are as follows:

1	Length of North Breakwater	2,100 m
2	Length of South Breakwater	1,150 m
3	Length of Approach Channel	3,300 m
4	Width of Approach Channel	160 m
5	Depth at Approach Channel (below CD)	16.1 m
6	Depth at Manoeuvring Areas (below CD)	15.5 m
7	Diameter of Turning Circle	500 m
8	No. of coal berths (length in m)	2 (600m)
9	Dredged depth at berth	15.5 m CD
10	Dredging quantity	11 million m ³

4.3 Captive Desalination Plant

The fresh water requirement for the proposed thermal power plant is estimated as 30 MLD. In order to meet the water demand, a captive desalination plant of 30 MLD capacity is proposed.

The desalination plant typically comprises of the following:

- Sea water intake/outfall system
- Process operations
- Chemical dosing system
- RO system – 5 x 6 MLD streams
- Post treatment system

4.4 Salient Features of the Proposed Project

Table 4-1: Salient features of the Proposed Project

S.No	Item	Description
Thermal Power Plant		
1	Capacity	3600 MW
2	Configuration	2 x 600 MW Sub Critical Tech. and 3X800 MW Super Critical Tech.
3	Technology	Sub Critical Technology and Super Critical Technology
4	Power Evacuation	Exported through a 400 kilo volt (kV) switchyard located within the power plant. Six nos. of 400 kV lines are proposed to export the generated power.
5	Fuel	Imported Coal
6	Sources of Fuel	Indonesia Coal Mines
7	Fuel Requirement	About 15.0 MTPA
8	Sulphur Content	0.13%
9	Stacks	2X275 m
Captive Port		
1	Capacity	About 15.0 MTPA of coal handling
2	Type	All Weather Port
3	No of Berths	Two
4	Length of Breakwaters	North:2,100 m, South: 1,150 m
Desalination Plant		
1	Capacity	30 MLD
2	Configuration	5X6 MLD streams
3	Technology	Reverse Osmosis
General		
1	Land	1181 Acres
2	Water Requirement	Sea Water:34,100 m ³ /hr
3	Source	RW: Sea, fresh Water: Proposed Desalination Plant; 0.5 MLD from TWAD
4	Environmental Aspects	<ul style="list-style-type: none"> ▪ Higher Calorific Value coal to reduce the consumption ▪ Lower Sulphur and ash percentage coal to reduce the emission ▪ Cooling Towers ▪ Super Critical technology to minimize the coal consumption and GHG emissions. ▪ Low NOx Burners ▪ ESP to minimize the PM emissions ▪ Two Stacks of height of 275 m to get better dispersion. ▪ Dust Control System to minimize the fugitive dust emission

S.No	Item	Description
		<ul style="list-style-type: none"> ▪ Fire Protection system ▪ High Concentrated Ash Slurry Disposal (HCSD) system ▪ Dust suppression system ▪ High Recovery RO technology to minimise the rejects ▪ Disposal of wastewaters through marine diffuser 1500 meters deep into sea ▪ Disposal of dredged material at 12-14 km deep into sea at 30m depth level

4.5 Utilities and Services

4.5.1 Water supply

Water requirement during the construction is expected to be 0.5 MLD which will be sourced from TWAD. The estimation of sea water required for thermal power plant and desalination plant during the operational phase, is 34100 m³/hr, which will be sourced from Bay of Bengal.

4.5.2 Power supply

The power during the construction phase of the project is 5 MVA at 11 kV (or above), will be sourced from Tamil Nadu Electricity Board (TNEB).

4.5.3 Wastewater/ waste management

Sewage generated will be treated in proposed sewage treatment plant (40 KLD). Storm water drainage system shall be provided for management of storm runoff. The sludge from the bottom of the seawater clarifier is discharged to a sludge pit from where it is partly re-circulated back to the clarifier inlet. Excess sludge will be pumped to return cooling water (seawater) discharge system. The sludge generated from the oily waste treatment system will be collected separately and disposed to the vendors approved by the Tamil Nadu Pollution Control Board (TNPCB). The sludge generated from the sewage treatment plant (STP) will be dried and used as manure to the greenbelt.

4.5.4 Fire protection system

Fire fighting and rescue facilities with adequate well-trained fire personnel will be provided within the power plant. The plant fire protection system will consist of hydrant system, high/medium velocity water sprinkler and potable fire extinguishers. Portable fire extinguishers are placed at all required locations where hydrant systems or spray water systems are not accessible. The fire protection system will be designed as per Standards prescribed by the National Fire Protection Association (NFPA)/Tariff Advisory Committee (TAC) of India.

4.6 Project Cost & Implementation Schedule

The overall project cost is estimated as Rs. 20,390 Crores.

It is pertinent to mention that initially 5x800 MW super critical technology based units were considered. However, due to the significant delay periods in delivery of the super critical technology/equipments by the suppliers, the configuration has been revised to

2x600 MW based on sub-critical technology and 3x800 MW based on super critical technology. This change in the configuration facilitates power generation to the tune of 1200 MW within (First 600 MW unit in 33 months and second in 39 months) 39 months and the remaining 2,400 MW (First in 800 MW unit in 48 months; second in 54 months; and third in 60 months) later, while the establishment is simultaneous. The duration of port construction is expected to be about 28 months.

5. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) STUDY

EIA study for the proposed thermal power plant, desalination plant and captive port covers both terrestrial and marine environments.

ITPCL submitted the proposal (Form-1, Draft Terms of Reference (ToR) for EIA studies and Prefeasibility Report) to the Ministry of Environment and Forests, Government of India (MoEF) for the consideration by the Expert Appraisal Committee (EAC) for thermal power projects. Committee reviewed and considered the project during its meeting on June 11, 2008. Accordingly, the MoEF approved the ToR vide letter F.No: J-13012/34/2008-IA.II (T), dated 9th July 2008. Consultants carried out the study and the resultant observations are presented in the following sections.

5.1 Study Area and Period

An area within 10 km radius with project site has been earmarked for the study. The baseline environmental data was generated during pre-monsoon period of 2008.

5.2 Description of the Environment

The environmental setting of project site is given below.

Table 5-1: Environmental Setting of Project Site

S. No	Particulars	Details
1	Plant site latitude and longitude	Northwest corner- 11° 32' 20" N and 79° 44' 06" E Northeast corner – 11° 30' 25" N and 79° 44' 34" E Southeast corner- 11° 31' 48" N and 79° 45' 28" E Southwest corner- 11° 30' 25" N and 79° 44' 34" E
2	Plant site elevation above mean sea level (MSL)	1.5 m to 2.0 m CD
3	Present land use at the site	Barren land interspersed with casuarina and cashew nut trees.
4	Plant site boundary to coast	More than 0.5 km and away from the HTL on land side
5	Nearest highway	NH 45 A (at 2 km towards the West)
6	Nearest railway Station	Alapakkam (9 km North)

S. No	Particulars	Details
7	Nearest airport	Pondicherry (46 km), Chennai (180 km)
8	Nearest port	Cuddalore (24 km), Chennai / Ennore at about (180 km)
9	Nearest town/village	Chidambaram – 17 km, Parangipettai – 3 km
10	Hills/valleys	Nil
11	Topography	Coastal flat terrain sloping towards the East
12	Archeologically important places	Nil within 10 km zone
13	National parks/wild life sanctuaries	Nil within 10 km zone
14	Reserved and protected forests	Pichavaram mangroves are located at 9.5 km from the stack of the proposed project towards South direction
15	Seismicity	The study area falls in Seismic Zone II (low risk zone)
16	Defence installations	Nil within 10 km zone

5.2.1 Compatibility of Coastal Regulation Zone (CRZ)

Physical demarcation of high tide level (HTL), low tide level (LTL) and delineation of CRZ boundaries for the project site were carried out by National Institute of Oceanography (NIO), Visakhapatnam which is one of the MoEF-authorized agencies. The project site lies between the open coast of Bay of Bengal on the East and Buckingham canal on the West. The project development area does not fall or contain the environmentally sensitive area as specified in the CRZ Notification. The CRZ classification of the project area meets the requirements of CRZ-I (ii) & CRZ-III.

5.3 Baseline Environmental Conditions

Baseline environmental studies for various environmental attributes were carried out during the months February to May, 2008 covering pre-monsoon season.

5.3.1 Marine environment

Marine environmental monitoring for representing the water quality, sediment quality and marine ecology in project region covering the extent between the proposed seawater intake and marine outfall for the thermal power plant and the Pichavaram mangroves located about 9.5 km from the stack of the proposed project towards South direction

- The presence of a good plankton community structure, good benthic structure and higher oxygen levels indicate that the waters are free from pollution and also support good aquatic life.
- Observations in terms of chemical and biological parameters reflect ambient coastal processes which are at normal levels coinciding the basic bio-geochemical process of the coastal environment. The levels of hydrocarbon (Oil & Grease) and heavy metals are found to be within the permissible limits.

5.3.2 Terrestrial environment

5.3.2.1 Ambient air quality

The prime objective of the baseline air monitoring is to evaluate the existing air quality of the area. This will also be useful for assessing the conformity to standards of the ambient air quality during the operation of the proposed power plant. Ambient Air Quality Monitoring (AAQM) stations were set up at fifteen locations. The samples were collected twice in a week for one complete season, suspended particulate matter (SPM), respirable suspended particulate matter (RSPM), oxides of Sulphur (SO₂), oxides of Nitrogen (NO_x) were collected on a 24-hourly basis and CO, HC on an 8-hourly basis. Respective details are given in the table below:

Table 5-2: Ambient Air Quality Monitoring

Location Code	Name of Location	Distance (km) & Direction w.r.t Stack	Distance (km) & Direction w.r.t nearest boundary	Remarks	98 th Percentile (µg/m ³)			
					SPM	RSPM	SO ₂	NO _x
A1	Toppiruppu	2.2, WSW	0.6	Residential Area	105	22	6	8
A2	Chinnur	2.1, SE	1.0	Residential Area	84	21	6	8
A3	Vathiyapalli	2.9, SE	1.3	Residential Area	131	32	9	12
A4	Velingarayampettai	1.4, NNE	0.7	Residential Area	80	16	6	8
A5	Porto Novo	3.8, SE	2.3	Commercial & Residential Area	121	32	8	11
A6	Samiyarpettai	2.6, NNE	2.0	Residential Area	79	15	6	8
A7	Silambimangalam	4.4, NNW	2.0	Residential Area	129	48	13	16
A8	Periyappattu	5.1, NNW	2.7	Residential Area	153	78	16	21
A9	Porto Novo Station	6.4, S	4.3	Residential Area	149	60	16	17
A10	Tachchakkadu	8.1, WSW	6.2	Residential Area	84	18	7	9
A11	Sirupalaiyur	7.9, WNW	5.7	Residential Area	78	14	6	8
A12	Puvalai	8.6, W	6.9	Residential Area	84	19	7	9
A13	Ayyampettai	6.6, N	5.2	Residential Area	85	16	6	8
A14	Killai	8.6, SSE	6.9	Residential Area	81	16	7	9
A15	Chidambaram	12.2, SSW	9.9	Commercial & Residential Area	105	22	9	12

Observations:

The 98th percentile values of SPM, RSPM, Oxides of Sulphur (SO₂), Oxides of Nitrogen (NO_x), Hydrocarbons (HC), Ozone and Carbon Monoxide (CO) were monitored and found to be within the limits prescribed by Central Pollution Control Board (CPCB) for rural and residential areas.

5.3.2.2 Ambient noise levels

Noise levels were monitored at nineteen (19) locations for assessing the existing noise levels in and around the project site. The monitoring was carried out once in the season for 24 hours and the details of the same are given in the below table.

Table 5-3: Ambient Noise Levels

Location Code	Name of the Location	Distance (Km) w.r.t. nearest boundary	Remarks	$L_{eq(d)}$ (dB(A))	CPCB standard	$L_{eq(n)}$ (dB(A))	CPCB standard
N1	Toppiruppu	0.6, W	Residential	53.59	55	39.68	45
N2	Chinnur	1.0, SE	School & Residential	46.76	50	38.24	40
N3	Vathiyapalli	1.3, SE	Residential	56.35	55	44.27	45
N4	Velingarayampettai	0.7, NNE	Residential	49.47	55	38.87	45
N5	Puduchchattram Station	1.1, NW	Commercial & Residential	60.76	65	46.01	55
N6	Kothattai	3.1, WSW	Residential	44.18	55	33.44	45
N7	Porto Novo	2.3, SE	Residential	58.11	55	42.66	45
N8	Samiyarpettai	2.0, NNE	Residential	49.23	55	39.26	45
N9	Villiyannallur	2.6, WNW	Residential	50.5	55	34.94	45
N10	Silambimangalam	2.0, NNW	Residential	59.18	55	49.58	45
N11	Periyapattu	2.7, NNW	Commercial & Residential	63.35	65	50.59	55
N12	Porto Novo Station	4.3, S	Residential	51.78	55	38.76	45
N13	Tachakhadu	6.2, WSW	School & Residential	44.85	50	34.65	40
N14	Sirupalaiyur	5.7, WNW	Residential	43.23	55	35.87	45
N15	Puvalai	6.9, W	Residential	45.75	55	34.25	45
N16	Ayyampettai	5.2, N	School & Residential	47.98	50	38.98	40
N17	Killai	6.9, SSE	Commercial & Residential	49.59	65	37.44	55
N18	Tanur	5.7, NW	Residential	58.89	55	47.36	45
N19	Chidambaram	9.9, SSW	Commercial & Residential	60.98	65	49.63	55

Observation:

The equivalent values for day and night time noise levels are well within the stipulated CPCB Standards for residential and commercial areas at all monitoring locations except N3, N7, N10 and N18 during the study period. Day time noise levels are slightly higher

at locations N7 and N3. But night time noise levels are well within the limit. At N7, the monitoring was conducted near Centre for Advanced Studies in Marine Biology, Annamalai University, where movement of people and vehicles during day time could have contributed to the increased levels.

At location N3, slightly higher noise levels were recorded during the day time. As observed, this noise level was due to vehicles plying on the road, construction of new broad gauge railway line near the village and domestic activities. The monitoring locations N10 and N18 which are near the National Highway (NH-45A) have also recorded slightly higher noise levels (both in Day and Night) compared to other locations.

5.3.2.3 Inland Water Quality

Eighteen (18) monitoring locations were identified for ground and surface water quality assessment in different villages around the project site. The samples were collected once in the season and the details of sampling locations are presented in the below table.

Table 5-4: Water Sampling Locations

S. No	Location	Distance (km) and Direction w.r.t nearest boundary of the project site	
Groundwater Sampling Locations			
GW1	Chinnur	1.6	SE
GW2	Vathiyapalli	2.4	SE
GW3	Velingarayampettai	2.7	NNE
GW4	Puduchchatram Station	1.3	NW
GW5	Samiyarpettai	1.8	NNE
GW6	Silambimangalam	2.2	NNW
GW7	C. Manambady	3.6	SSE
GW8	Periyakummatti	3.9	WSW
GW9	Palvattunna	3.8	WNW
GW10	Atranadhapuram	3.2	NNE
GW11	Ayipuram	7.0	SW
GW12	Killai	6.9	SSE
GW13	Alapakkam	5.7	NW
GW14	Tanur	6.8	NW
GW15	Chidambaram	10.	SSW
Surface Water Sampling Locations			
SW1	Vellaru River (near Porto Novo Station)	3.8	S

S. No	Location	Distance (km) and Direction w.r.t nearest boundary of the project site	
		Distance (km)	Direction
SW2	Uppanar River(near Alpakkam)	7.0	N
SW3	Perumal Eri (near Krishnapuram)	7.9	NW

Observations:

Almost all the parameters are well within the limits specified as per Drinking Water Quality Standards (IS: 10500, 1991). The total dissolved solvent (TDS) values observed at Chinnur [2,282 milligrams per litre (mg/l)] are found to be higher than the permissible limit probable due to sea water ingress (proximity to coast).

5.3.2.4 Soil Quality

The soil found in the coastal region is of the erinaceous type (sandy) which is suitable for casuarina plants. Considering the soil profile in the study area, 12 sampling locations have been selected and the details of the sampling locations are presented in the below:

Table 5-5: Soil Sampling Locations

Location Code	Location Name	Distance (km) & Direction w.r.t. nearest boundary of the project site	
		Distance (km)	Direction
S1	Chinnur	1.0	SE
S2	Vathiyapalli	1.3	SE
S3	Velingarayampettai	0.7	NNE
S4	Puduchchatram Station	1.3	NW
S5	Villiyallur	4.1	WNW
S6	Periyapattu	2.7	NNW
S7	Tachakhadu	6.2	WSW
S8	Puvalai	6.9	W
S9	Ayyampettai	5.2	N
S10	Killai	6.9	SSE
S11	Tanur	8.2	NW
S12	Chidambaram	9.9	SSW

Observations:

The pH of the soils ranged between 6.7 and 9.04 indicating neutral to alkaline in nature. The soil colour is dark brown to black. Red soil is observed at Vathiyapalli.

Loamy sandy texture soils dominated the study area with Sand (%) range from 21.43 to 41.86, Silt (%) range from 30.47 to 53.19 and Clay (%) range from 12.64 to 48.08. Bulk Density of the soils ranged from 1.31 to 1.44 gm/cm³. The Infiltration Rate was found to be between 1.26 and 2.9 cm/hr. The Water Holding Capacity of the soils varied from 29.8 to 45.44%. Porosity of the soils varied from 17.66 to 29.4%.

5.3.2.5 Flora and Fauna

Department of Forests has identified a total number of 1150 species of floral varieties and about 190 varieties of faunal varieties in the Cuddalore division, which include mammals, birds, and reptiles. There is no endemic or threatened species of flora and fauna observed in the project region.

An area of about 1471.33 hectares (ha) where the Pichavaram mangroves are spread over has been identified as an Ecologically Important Area by the MoEF. The Pichavaram mangroves, harbours different species of birds, due to availability of different habitat types such as channels, creeks, gullies, mud flats and sand flats and adjacent sea shore.

5.3.3 Baseline socio-economic conditions

Primary survey

- Primary survey was carried for assessing the existing social conditions of the villages and hamlets falling within the study area.
- About 12 villages were surveyed including five post-Tsunami Rehabilitation Colonies.
- The survey covered about 1976 households with an overall population of 7816.
- In 1976 households, 548 households were covered under post-Tsunami Rehabilitation Programme.
- Total occupation pattern constitutes of 51% in the total population. Fishing is the primary activity.

Secondary data

- About 12 census villages fall within the study area with an overall population of 32,480.
- Almost all the villages in the study area have basic school facilities *i.e.*, primary schools. Few villages have upper primary and high school facilities
- The main occupation of the people is agriculture. Cultivators, agricultural labourers, household industrial workers, construction workers, fishermen, etc represent the main and marginal workers.
- Protected water supply is available in almost all villages in the study area.

- Most of the villages have power supply for domestic purposes, and agriculture through TNEB.
- Almost all villages in the study area are well connected by village or major district roads.
- There are no notified archaeological or cultural monuments in the study area.

5.4 Anticipated Environmental and Social Impact with Mitigation Measures

The anticipated impacts on the environmental and social attributes, which are likely to arise due to construction and operation of the project were identified, predicted and evaluated.

5.4.1 Construction Phase

Developmental activities such as construction of intake/outfall systems, capital dredging, dredge spoil disposal and development of offshore structures will result in disturbance to the marine environment. Site grading and development, civil construction and mechanical erection of facilities, onsite infrastructure, environmental management facilities and back up area development are likely to cause impacts on the terrestrial environment.

The impacts during construction are short-term in nature and will cease on completion of construction activities.

5.4.2 Operation Phase

Mathematical modeling for hot water and brine discharge, littoral drift transport and air pollutant dispersion was also carried out to identify the significance of impacts. The models engaged were:

- **Offshore and Coastal Dispersion (OCD) Model:** OCD model is an extension of the classical Gaussian plume model, specifically designed to evaluate the impact of coastal or offshore emission sources including the fumigation episodes. For the impact assessment due to proposed project, OCD5 model has been simulated for the point sources with the onsite observed meteorological condition during the period Feb-May, 2008.
- **MIKE 21 HD-AD Model:** The discharge of hot water, brine and disposal of dredged material into the marine environment may exert impact, if not scientifically disposed. In order to study the impacts of the hot water from the proposed power plant, hydrodynamic modelling studies have been carried out using MIKE 21 HD-AD model.
- **COSMOS – 2D Model:** The mathematical modelling studies for the littoral drift were carried by HR Wallingford (HRW) using COSMOS-2D, which is designed for several purposes including calculations of longshore and cross-shore sediment transport rates. In each case, the wave, current and sediment transport parameters are calculated at grid points along a shore-normal line extending from the upper part of the beach to depths beyond the surf zone

5.4.2.1 Impact on Pichavaram mangroves

The Pichavaram mangroves are located at about 9.5 km to the South of the proposed stack. The impact on Pichavaram mangroves is addressed with respect to (w.r.t) the following aspects:

Impact due to stack emissions

The ambient air quality was monitored at Killai village which is located at 8.6 km towards the South from the proposed stack of the project and 6.9 km from the nearest boundary of the plant considering their proximity to Pichavaram mangroves. The resultant NO_x, SO₂, SPM concentrations predicted using the OCD model for the above locations are 19.6 µg/m³(monitored average background Conc. is 9.00 µg/m³) , 21.96 µg/m³ (monitored average background Conc. is 7.00 µg/m³), 84.54 µg/m³(monitored average background Conc. is 81.00 µg/m³) respectively. The resultant NO_x, SO₂, SPM concentrations are within the NAAQS limits for residential and rural areas. Thus, it is clearly evident that impact on Pichavaram mangroves due to stack emissions is insignificant.

Impact due to thermal discharge

The recirculation pattern of thermal discharge was studied. The marine diffuser is located at 1500 m inside the sea to the north of the breakwater structure. Thus the resultant thermal effect is just limited to 50 m, even in the critical periods. As such, the Pichavaram mangroves are located at above 10 km from the marine diffuser out let point (water travel distance) towards south, therefore, the impact on the Mangroves is insignificant. However, environmental monitoring programme during construction and operation phases near Pichavaram mangroves is proposed.

Environmental Monitoring Programme

Environmental Monitoring Programme is an important component during environmental management of the project. Mitigation measures during construction and operation phases can be revised based on monitoring results.

5.4.3 Budgetary Estimate for Environmental protection

The total capital cost of pollution control equipment and implementing the Environmental Management during construction phase including the Environmental Monitoring programme is estimated as Rs. 779.51 Crores and the annual recurring cost including the environmental monitoring programme during the operation phase is estimated as Rs. 4.97 Crores per annum.

5.5 Risk Analysis & Disaster Management Plan (DMP)

Preliminary risk analysis was carried out for the various risks associated with the construction and operation of the proposed thermal power plant, desalination plant and captive port. The analysis covered the following.

- Hazard Identification including potential release events

- Consequence modelling of release rate, atmospheric dispersion, and impact on people (using toxicity models) to estimate the effects of the representative events.
- Risk reducing measures

The risk analysis thus carried out also provides inputs for formulating the onsite DMP.

As the proposed project has three components viz., thermal power plant, captive port and desalination plant; three specific DMPs were formulated with an integrated approach. The specific component team where the emergency has arisen would be in charge of the situation while the other two teams would assist them as and when required. The plan will include the following elements:

- Assessment of the magnitude and nature of the events foreseen and the probability of their occurrence
- Formulation of the plan and liaison with outside authorities, including the emergency services
- Procedures for raising the alarm and communication both within and outside the power plant, port and desalination plant
- Appointment of key personnel and their duties and responsibilities (organisational structure)
- Emergency control centre
- Action on site and off site

The DMP is prepared in conjunction with and taking into consideration all technical reviews and suggestions, as per acceptable norms and hence, will meet any eventuality.

5.6 Social Impact

5.6.1 Land acquisition

The project does not involve resettlement. Land acquisition for the project is limited to cultivated and barren lands of Ariyakoshti, Villiyannallur and Kothattai revenue villages and transfer of government land. The agency is purchasing land directly from each individual land owner through direct consent and private negotiations. Thus the issue of land acquisition and any provisions of the Land Acquisition Act of 1894 (with an amendment of 1984) do not apply. The provisions of NRRP, 2007 have been referred while carrying out the Social Impact Assessment.

5.6.2 Common Property Resources

Two graveyards are falling within the project layout. One graveyard is used by the community of Karikuppam and Panchakuppam. The other graveyard belongs to Pudukuppam village. Alternate arrangements and associated infrastructure for the burial sites and crematoria shall be discussed and finalized in consultation with the local community.

5.6.3 Roads and Transportation

There are many tarred roads offering connectivity to the seaward side hamlets and the villages on the landward side. That will face severance once the plant is constructed. Alternate routes explored by the project in consultation with the local community and other stakeholders and good roads will have to be constructed. New roads will facilitate the movement of people and products from these villages to the nearby markets and towns.

5.6.4 Employment and Income

There would be a partial short term impact during construction of the project on the local community dependant upon fishing. The project would take efforts to mitigate it in consultation with local community.

5.6.5 Houses and Land

The project impact on the residential structures will be physical, social and emotional. About 15 residential structures might get impacted due to the project. The relocation does not generally have the same social setup that existed, the social system is disturbed. And lastly the emotional attachment is normal to all humans for the place of residence or existence where one has lived for the better part of their lives. These are things that cannot be measured or quantified.

There could be willingness amongst the affected population for relocation, but sufficient counseling and time has to be provided to them for relocating themselves and their families.

5.6.6 Livelihood of agricultural and Non-agricultural labourers

Land acquisition will have an indirect impact on the landless labourers who were dependent on the agricultural lands for their livelihood. About 158 landless labourers who were engaged in agricultural and allied activities would be affected. Alternate jobs in the unskilled and skilled category would be available during the construction phase of the project. Such labourers with training and guidance can be gainfully employed in the project activities during the construction phase.

5.6.7 Fishing activity

About 610 fishermen are engaged in fishing and allied activities in the project area. The important villages are C.Pudupettai, Indiranagar and Pudukuppam. There would be temporary short term impact on immediate access to the sea and access to their berthing area, net mending sites and storage area during the construction phase. The project would provide alternate routes to sea front and berthing areas in consultation with the stakeholders and extend support for development of any facility that assists the fishing business and enhances their income.

5.6.8 Construction Workers Camp

The construction of the project would require a large work force. To ensure that there is no strain on the existing infrastructure, the worker camps will be self-sufficient and

would not rely on any local resources. This would also ensure that there is no conflict with the local population. Further, the worker camps will be located away from the coast and habitations and will be within the project site. To mitigate the impact, particularly health hazards, proper sanitation facilities will be provided.

5.6.9 Employment potential

The project will provide a direct employment potential of 5100 persons during construction phase and 1015 persons during the operation phase of the project.

5.7 Environmental Management Plan

The effective implementation and close supervision of the environmental management to mitigate the environmental impacts, which are likely to arise due to the construction and operation phases of the project could be achieved through a suitable institutional mechanism. During construction and operational phase, ITPCL will adopt an Environmental Management System which can be proposed to be certified under ISO 14000. The objective of ISO 14000 is to establish a system to assess, monitor and manage environmental performances, which can be used to promote continued environmental improvement and the prevention of pollution.

6. GREENBELT DEVELOPMENT

Afforestation is a key element in environment conservation and protection. The establishment of a vegetation covering land in and around the proposed thermal power plant *i.e.*, ash disposal area, coal handling area etc. and captive port, will result in many direct and indirect benefits. With a view to attenuate noise propagation and mitigate fugitive air pollution impacts, it is planned to develop a greenbelt all along the periphery of project site. Compatible species have been identified for greenbelt. Saplings will be suitably nurtured. Regular watering, soil conditioning and fertiliser application will be undertaken.

As per the MoEF stipulations, green belt will be provided all around the power plant boundary by planting trees and the total green area including landscaping area will be 1/3rd of the plant construction area. Greenbelt with a width of 50-m to 100-m will be developed around the plant site. For the proposed thermal power plant, an extent of about 121.4 hectare (300 acres) will be utilized for green belt development.

7. PROJECT BENEFITS

The proposed development of Project will bring significant benefits, primarily include:

- Augmentation of power supply to TNEB grid which will substantially reduce the energy deficit.
- Enhancement in the economy of Tamil Nadu and substantial positive impact on the socio-economic profile of the Cuddalore region, in particular and Tamil Nadu in general, both in terms of overall employment & skill development of the local workforce.
- Direct as well as indirect employment potential

- Augmentation in the infrastructure resources due to the project in the region in respect of transport, communication, health facilities and other basic facilities etc.

8. CORPORATE SOCIAL RESPONSIBILITY

ITPCL is committed towards fulfilling its social obligations of conducting business. The following are the initiatives towards CSR.

- Public health centres and conducting medical camps
- Educational facilities for the poor children in surrounding villages
- Vocational training institutes for building up of skill force
- Public power supply and drinking water supply for common facilities in surrounding villages, Access roads and Sanitation facilities in surrounding villages
- Afforestation and environment preservation activities – women empowerment in the surrounding villages
- Supporting servicing organisations for disabled persons, mentally and physically challenged in surrounding villages
- Supporting sports and heritage preservation etc.