

EXECUTIVE SUMMARY

1.0 Introduction

ETA POWERGEN Pvt. Ltd., is a subsidiary of ETA star Group of Dubai which is a Multi National Company. It has secured a license from the State Government of Tamil Nadu to set up a bio-mass based power generation of 10 MW project in Virudhunagar District, Tamil Nadu.

1.1 Incentives

- Capital subsidy is granted for 10 MW (Biomass Power Plant) to the tune of Rs.1 Crore by MNES (Ministry of Non –Conventional Energy Source), Government of India
- Concessional Custom Duty
- Excise duty is exempted for indigenous supplies
- Tax holiday for about 5 to 10 years

1.2 Viability

The project is techno economically viable, based on the various technical and financial analysis for generating power using bio-mass. During the growth of plants, CO₂ absorbed during photosynthesis. The same quantity of CO₂ will be released on burning, and will be again absorbed while growing (juliflora plants). Branches of juliflora will be cutted, leaving the stem for the future growth. In this way the process is neutral and qualifies for carbon credit from the developed countries. Incidentally this is revenue for the biomass power generation plant. The quantity of CO₂ for 10 MW power plant is around 51,500 tonnes/year.

1.3 Clean Development Mechanism Opportunities

- Alternate Energy Sources and Fuel Switch
- Biomass Based Power Generation
- Waste to Energy Options
- Fly Ash Blend in Cement Manufacturing

1.4 Biomass Project

- Bio-mass projects are the most popular among CDM initiatives
- The merits of the Bio-mass projects for CDM are centered around the following aspects
 - Avoidance of methane emissions due to decay and de-gradation of the bio-mass waste
 - Approaching CO₂ neutrality in production and utilization of bio- mass for heat and power generation and avoiding CO₂ emissions from the fossil fuels for the corresponding requirement

1.5 Advantages of the Biomass Based Power Plant

- Green power
- Renewable energy, qualifying for incentives from MNES
- Reduced cost for fuel transportation
- Generation of Employment in the local area
- Attractive financial incentives
- Better / optimal utilization of available biomass material
- Proven technologies for the steam generation / power generation from biomass are available
- Government of India and Government of Tamil Nadu encouraging vigorously for such type of projects.

1.6 Project Brief

- ETA POWERGEN Pvt. Ltd., proposes to establish a power station, of 10 MW power generating capacity at Periyampatti Village in Virudhunagar District of Tamil Nadu
- The proposed project would require 120 Acres of land

- In the proposed power plant, one traveling grate boiler will be installed which will be fired on biomass (Juliflora, Cotton stalk and Maize stalk) sourced from in and around Virudhunagar
- The total woody biomass requirement for the project will be 235.2 tonnes per day
- The water requirement for the proposed project is 10.68 m³/hr which will be drawn from the bore well
- One 55 m a flue stack with ESP of 99.9% efficiency will be provided to control particulate matter to below to 100 mg/Nm³

1.7 Technology

Combustion technology route is selected for the power plant, where in bio-mass is burnt as fuel in a steam generator to produce high pressure steam which is then expanded in a steam turbine to generate power

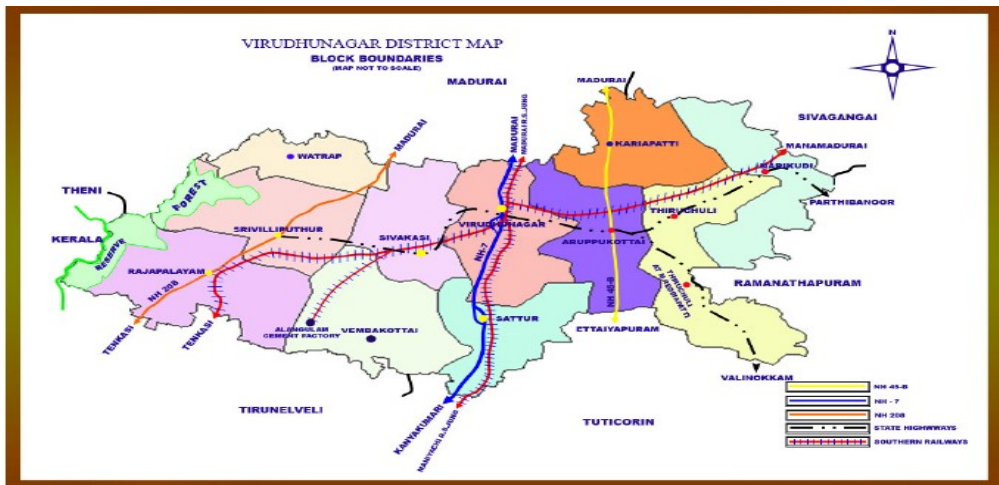
Salient Features of the Project Site

Nature of the project	Industrial Greenfield project (for the proposed power plant)
Size of the project	10 MW power project
Cost of the project	46.31 Crores
Location of project	
District & state	Virudhunagar, Tamil Nadu
Taluk	Sattur
Village	Perayyanpatti
Land Availability	120 acres
Nature of the area	Barren land
Latitude	9° 35' N
Longitude	77° 57' E
General Climatic Conditions	
Maximum Temperature	37°C
Minimum Temperature	20°C
Annual Rainfall	812 mm
Surface Elevation	8 M above MSL
Accessibility	
Road Connectivity	NH 7
Rail Connectivity	Sattur is about 15 kms from plant
Airport	Madurai 90 kms from the plant
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
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1.8 Justification of the Project

- Tamil Nadu has a significant demand – supply gap, which is evidenced by the reported 12.6 % peak demand shortage in FY 06-07
- The peak demand of Tamil Nadu is expected to increase from existing 8966 MW in 2006-07 to 14224 MW by FY 11-12
- This will require an increase in supply of about 5258 MW to bridge the demand & supply gap by the end of the 11th five year plan
- The proposed project at Virudhunagar District by ETA POWERGEN Pvt. Ltd., would assist in meeting the increased demand of power in Tamil Nadu/Southern grid



1.9 Project Description

The proposed independent thermal power plant will consist of one number of Traveling grate boiler and one number condensing steam turbine of nominal capacity of 10 MW (Gross). The Traveling Grate Boiler & Auxiliaries will have following system:

- Firing System
- Air System
- Draft System
- Fuel Handling and feeding System

- Electrostatic Precipitator
- Ash Handling System
- Turbo Generator System & Water Treatment Plant

1.10 Salient Features of Proposed Power Plant

1	Capacity	10 MW
2	Type of boiler	Single-drum, vertical, multi pass, semi-outdoor, natural circulation traveling grate
3	Power evacuation	Power generated at ETA is evacuated at 110 kV switchyard located within the plant by transmission line connecting to the nearest sub-station
4	Fuel	Woody Biomass
5	Source of fuel	In & around Virudhunagar
6	Fuel requirement	235.2 tpd
7	Sulphur content	0.3 %
8	Ash content in biomass	5 %
9	Ash generation	35 tpd
10	Bottom ash	7 tpd
11	Fly ash	28 tpd
12	ESP efficiency	99.9 %
13	Stack	One flue stack of 55 - m height
14	Raw water requirement	10.68 m ³ /hr

1.11 Products and Production Capacity

- Production Capacity of proposed power plant will 10.0 MW

Fuel Requirement

S. No.	Raw Materials	No. of days / Year	Quantity / Day
1.	Juliflora	225	235.2
2.	Cotton stalk	75	255.46
3.	Maize stalk	50	258.66

1.12 Fuel Survey

Fuel survey has been conducted by Institute for Energy Studies, Anna University, Chennai in the following taluks,

S. No	District	Taluks
1	Virudhunagar	Aruppukottai, Kariapatti, Rajapalayam, Sattur, Sivakasi, Srivilliputhur, Thiruchuli, Virudhunagar
2	Madurai	Peraiyar, Thirumangalam
3	Ramanathapuram	Kamuthi

4	Thirunelveli	Sankarankoil
5	Thoothukudi	Ettayapuram, Kovilpatti, Ottapidaram, Vilathikulam

Fuel Survey – Result

- Fuel Availability - 2,00,000 Tonnes / Yr
- Fuel Cost - Rs.1200 / Tonnes
- Fuel requirement for the proposed biomass power plant - 85,000 Tonnes /Y
- In the study area 40 major & minor biomass dealers have been identified dealing business for more than a decade

1.13 Fuel Handling and Feeding System

The design of fuel handling system, involving biomass fuels is based on the estimated quantities of annual fuel requirements Fuels will be received at the site by road. Adequate road facilities will be provided to handle the road-bound vehicles on a daily peak basis. The fuels arriving at site by different types of vehicles such as trucks, tractor trailers etc. will be weighed on a pitless type electronic road weighbridge provided in the plant premises.

1.14 Boiler and Auxiliaries and Firing System

The boiler will be sized to produce 45 tph steam under normal conditions. The proposed boiler will be primarily bio-mass fired single-drum, vertical type balanced draft with a furnace having traveling grate type furnace. The boiler will consist of air pre-heater, economizer, evaporators, super-heaters, fuel firing equipment, integral piping, flue gas ducting with expansion joints, supporting structures, platforms and walkways, etc.,

The firing system consists of a traveling grate, air plenum, regulating dampers and ash discharges valve. The traveling grate is driven by a hydraulic arrangement and the tie bars of the traveling grates are made of cast iron, to withstand the heat from the burning. The combustion air to the grate is supplied from the bottom plenum hoppers and the air is controlled by the air dampers. The discharge end of the grate discharges the ash into a water

impounded hopper. The shifting are collected in the plenum hopper and discharged by an air lock valve.

1.15 Draft System and Electro-Static Precipitator

The boiler will be equipped with one number of forced draft fan, secondary air (SA) fan and induced draft fan. The FD & SA fans will supply the required combustion air to the boiler. The flue gases generated in the boiler will be evacuated by the ID fan and the capacity and head of FD fan will be selected considering maximum air that would be required for the fuel firing modes. In the same way, ID fan will also be selected based on the maximum flue gas generated in any of the fuel firing modes under consideration.

The boiler is connected to an electro-static precipitator, which will remove the dust and ash particles from the flue gas, before the ID fan could handle it. The efficiency of the precipitator will be 99.9% and the dust concentration at the outlet of the ESP will be less than 100.0 mg/Nm³.

1.16 Turbo Generator and Auxiliaries

The system consists of one multistage steam turbine coupled with an electric generator, air cooled condenser, air ejector system for air cooled condenser, condensate pumps, lubricating oil and governing oil system. Controls and instrumentation are provided as per the needs. The proposed biomass based power plant, will have one no. 10.0 MW turbo generator. The turbine is provided with devices to safeguard against over speed, low steam inlet pressure, high axial movement of the shaft, low lube oil pressure, high condenser vacuum, excessive vibration etc.,

1.17 Utilities

Power generation will be 10.0 MW during the operation. The Auxiliary power (Home load) demand will be 0.9 MW. The balance power 9.1 MW will be exported to TNEB grid. Emergency

Power System consists of 1 No. DG Set of 250 kVA is provided to make available emergency power supply to the station in case of black out.

The total requirement of raw water for this unit will be 256 KLD. The entire raw water requirement for the unit will be met from dug well and bore well inside the factory premises.

The total workforce including staff and workers will be 50.

2.0 Baseline Studies

Baseline Environmental Studies were conducted to know the status of various Environmental attributes viz., Climatic and Atmospheric conditions, Air, Water, Noise, Soil, Hydro geological, Land use pattern, Ecological and Socio-Economical environment.

2.1 Ambient Air Quality

Ambient Air Quality Monitoring (AAQM) stations were set up at six locations. The details of the environmental setting of the locations are presented below:

S. No	Location Code	Location	Direction	Environmental Setting
1	AAQ1	Periyampatti	-	Residential Area
2	AAQ2	Avalnattam	SW	Residential Area
3	AAQ3	Karisalpatti	NW	Residential Area
4	AAQ4	Nalli	SEE	Residential Area
5	AAQ5	Kattaramanpatti	SE	Residential Area
6	AAQ6	Chinnathambiyapuram	NNE	Residential Area

Ambient Air Quality

Location	TSPM		RSPM		SO ₂		NOX	
	Max	Min	Max	Min	Max	Min	Max	Min
Periyampatti	82.2	65.7	23.0	18.1	8.9	6.1	16.2	12.5
Avalnattam	75.4	59.4	21.1	17.2	9.2	6.4	15.5	12.7
Karisalpatti	86.4	62.7	24.1	18.1	9.6	7.1	16.2	13.9
Nalli	89.2	69.1	23.3	19.1	9.4	6.0	16.0	12.2
Kattaramanpatti	74.9	55.2	20.1	16.0	8.8	7.2	16.3	13.0
Chinnathambiyapuram	85.4	65.2	25.6	17.0	9.6	7.3	14.0	12.5
CPCB STANDARDS								
Industrial Area	500		150		120		120	
Residential Area	200		100		80		80	

- TSPM - A maximum value of 89.2 $\mu\text{g}/\text{m}^3$ was observed at Nalli (AAQ4) attributing to the vehicle movement observed on the National highway close to this region. Next higher value of 86.4 $\mu\text{g}/\text{m}^3$ was observed at Karisalpatti (AAQ3). The 24 hours applicable limit for residential area is 200 $\mu\text{g}/\text{m}^3$
- RSPM - The maximum value of 25.6 $\mu\text{g} / \text{m}^3$ for RSPM was observed at Chinnathambiyapuram (AAQ6). The next higher value of 24.1 $\mu\text{g}/\text{m}^3$ was observed at Karisalpatti (AAQ3). The 24 hours applicable limit is 100 $\mu\text{g}/ \text{m}^3$ for residential areas
- SO₂ - The higher values of SO₂ were observed to be 9.6 $\mu\text{g}/ \text{m}^3$ at Karisalpatti (AAQ3) and 9.4 $\mu\text{g}/\text{m}^3$ at Nalli (AAQ4). The 24 hours applicable limit for residential area is 80 $\mu\text{g}/ \text{m}^3$
- NO_x - The higher values of NO_x were observed to be 16.3 $\mu\text{g}/\text{m}^3$ at Kataramapatti (AAQ5) and 16.2 $\mu\text{g}/\text{m}^3$ at Karisalpatti (AAQ3). The 24 hours applicable limit for residential area is 80 $\mu\text{g}/\text{m}^3$

2.2 Water Environment

Selected water quality parameters of ground water resources within the study area have been considered for assessing the water environment. To assess the water quality of the study area, seven ground water sampling locations were selected

S. No	Location	Distance from the Site (In km)	Quality
W1	Periyampatti	Plant Site	Ground Water
W2	Nalli	2	Ground Water
W3	Kanjampatti	3	Ground Water
W4	Karisalpatti	4	Ground Water
W5	Peddurediapatti	5	Ground Water
W6	Avalnattam	3	Ground Water
W7	Ilupaiyurani	6	Ground Water

- The results indicate that the average pH lies in between 6.7 and 7.7
- TDS ranges from 890 to 3550 mg/L
- Total hardness ranges from 310 to 1243 mg/L
- The chlorides were observed to be ranging between 199 and 586 mg/L. The above result shows that ground water quality in the study area not comply with drinking water standards

2.3 Noise Level Survey

The foremost objective of noise monitoring in the study area is to evaluate the baseline noise and assess the impact of the total noise expected to be generated by proposed project. Three locations were monitored for assessing the existing noise levels in and around the project location. The details of noise monitoring locations are given below:

Sr. No	Location
N1	Site
N2	Nalli (NH - 7)
N3	Avalnattam

2.3.1 Observations**Day time Noise Levels**

Noise levels during day time were found to be in the range 52.6 – 48.3 dB (A). The maximum noise level was observed to be 52.6 dB (A) at the Nalli (NH-7) (N2) and a minimum of 48.3 dB (A) was observed at Avalnattam (N3)

Night time Noise Levels

Noise levels observed to fall in the range 48.6– 46.5 dB (A) during the night time. A maximum of 48.6 dB (A) was observed at the Nalli (NH-7) (N2) and a minimum of 46.5 dB (A) in the village at Site (N1)

2.4 Soil Status

- It has been observed that the pH of the soil ranged from 7.5-8.2, indicating that the soils are neutral to slightly alkaline in nature
- The soil in the study area is predominantly of clay type. The Electrical Conductivity was observed to be in the range of 208-1799 $\mu\text{S}/\text{cm}$
- The nitrogen values are in the range of 12-288 mg/kg indicating that soils are low in nitrogen levels. The potassium values range between 127-1492 mg/kg, which indicate

that the soils have moderate to good quantities of potassium. The soil from the study area shows moderate to good fertility

2.5 Ecology

There are no wild life sanctuaries/parks with in 10 km radius of the project site. The area did not record the presence of any critically threatened species. The records of Botanical Survey of India and Forest Department also did not indicate presence of any high endemic or vulnerable species in this area.

2.6 Socio – Economic Status of the Study Area

It has been observed that majority of the people are agricultural workers residing within 10 Km radius of the project area.

3.0 Wastewater Generation

S. No	Particulars	Wastewater Generated m³/hr	Method of Treatment
1	Sewage	2.0	Septic tank with Dispersion trench
2	Softener regeneration & DM Plant	0.3	Neutralization tank
3	Filter back wash/ R.O reject	0.55	Waste Water Storage Tank
4	Boiler blow down	2.46	
5	Cooling tower blow down	1.159	

4.0 Land Degradation

Since, the small quantity of wastewater will be generated from domestic usages, the chances of contamination of soil will be nil. The vacant area in the industry will be used for tree plantation to improve the surrounding environment of the industry.

5.0 Rain water harvesting

Rain water collection system will be set up in proposed plant. Rain water from the plant will be collected in a separate collection system and is taken into the collection trench, which will be constructed in the proposed plant.

6.0 Air Emissions & Mitigation Measures

S. No	Description	Air Pollution Control Measures
1	Boiler (45 TPH)	55 m height and 1.8 m dia of stack with Electro Static Precipitator will be provided.
2	D.G set (250 KVA) – 1 no	9 m height and 0.3 m dia of stack with acoustic measures will be provided.

Air Pollution Control Measures

The unit has installed an electrostatic precipitator to the stack attached to the boiler so as to achieve the standards prescribed by the board. Electrostatic precipitator of 99.9% efficiency will be installed to limit the SPM concentrations below 100 mg/Nm³. A stack of 55-m height will be provided for wider dispersion of gaseous emissions. Conveyor belt will be closed to prevent dust generation and water sprinkling system will be provided at the material handling and storage yard so as to satisfy the Ambient Air Quality/emission standards prescribed by the board. The ash will be transported through trucks and the roads will be asphalted within the plant area. Adequate noise control measures will be provided to satisfy the ambient noise level standards prescribed by the board. Well maintained greenbelt covering 25 % of the land area will be provided to arrest the fugitive emissions.

7.0 Solid Waste Management

The main solid waste from the proposed Power Plant will be ash (Fly ash and Bottom ash). by the combustion of fuel in boiler which will be around 35 tons/day which includes the bottom ash, ash collected in the ESP ash hoppers. It is proposed to use the ash profitably by selling the same for brick manufacturing units, for road building material and for farmers, who can use the ash as manure for the crops. The ash is stocked in the silo which has a capacity to store 1 week generation of ash.

8.0 Noise Pollution Management

- Equipment will conform to noise levels prescribed by regulatory authorities
- Provision of acoustic enclosures to noise generating equipments like pumps
- Provision of thick greenbelt to attenuate the noise levels; and
- Provision of earplugs to the workers working in high noise level area

9.0 Socio – Economic Development

This project does not involve any displacement of local people. Employment opportunities will be improved in the nearby villages because of this proposed unit and this will provide direct employment opportunity for 50 persons.

10.0 Greenbelt Development

- Greenbelt is developed inside the factory premises covering a total area of about 10.5 acres
- The unit will also develop the nearby area around the industry for greenbelt
- The inter-spaces are laid with shrubs. The inter-space between trees planted is about 5m
- It is proposed to double the tree density in future

11.0 Safety PPE's -Operation and Maintenance

- Industrial safety helmets;
- Crash helmets;
- Face shield;
- Welders equipment for eye and face protection;
- Cylindrical type earplug;
- Ear muffs;
- Canister gas mask;
- Self contained breathing apparatus;
- leather apron;
- Boiler suit;
- Safety belt /line mans safety belt;

- Leather hand gloves;
- Canvas cum leather hand gloves with leather palm;
- Lead hand glove;
- Electrically tested electrical resistance hand gloves; and
- Industrial safety shoes with steel toe.

12.0 Environment, Safety and Health Monitoring Programme

The Environment, Safety and Health-Monitoring Programme in the factory are as follows:

- Monthly Monitoring of Stack Emissions – SPM, RSPM, SO₂, NO_x
- Daily Monitoring of Water and Treated Water – pH, TDS, TSS, COD
- Monitoring of Ambient Air - SPM, RSPM, SO₂, NO_x & CO, Noise and Work Place Air
- Occupational Safety
- Occupational Health

13.0 Budgetary allocation for Environmental Management

Category	Capital Investment	Annual Operating Costs
	(Rupees in Lakhs)	
Air Pollution Management	125	1
Water and Wastewater Management	50	2
Solid Waste Management	50	5
Greenbelt	5	1
Environmental Monitoring and Training	5	1
Total	235	10

14.0 Conclusion

This project will supply electricity to Tamil Nadu Power Grid and create job opportunities in local areas without affecting environment. This has been reinforced by the outcome of the above environmental study.