1. INTRODUCTION

India's industrial and commercial sectors consume about half of all generated electricity, agriculture consumes about a quarter, and others including residential consumers the balance of generated electricity. Although plant efficiencies have improved in the last few years, Politically- determined average tariffs (Rs 1.33/kWh) continue to be lower than the average cost of supply (Rs.1.60/k.Wh). Power shortages are estimated to be about 10% of energy requirements and 20% of peak capacity requirements, and are likely to increase in the coming years.

Global Powertech Equipments Ltd, is a Company formed for generation of power with the use of Bio-mass as fuel. They are proposed to set up 7.5 MW Bio-mass Power Plant at Ayalavadi Village (Survey Nos.12/1, 13/2 B, 11/1), Vandavasi Taluk, Tiruvannamalai District, Tamil Nadu.

This report presents the summary of Rapid EIA study conducted for proposed 7.5 MW bio-mass based Power Plant, based on three months field data (July 2008-September 2008) and data collected from secondary sources. The baseline environmental scenario and the possible impacts of the proposed with respect to air, water, soil, noise, ecology etc. was studied and report generated.

2. SITE AND SURROUNDINGS

The bio-mass power plant having installed capacity of 7.5 MW is proposed to be set up Ayalavadi Village (Survey Nos.12/1, 13/2 B, 11/1), Vandavasi where all major inputs required for setting up the proposed plant are available in ample measure Land measuring 13.45 acres for the proposed site has been purchased in Ayalavadi Village (Survey Nos.12/1, 13/2 B, 11/1), Pernamallur block, Vandavasi taluk, Tiruvannamali District, Tamilnadu which is on the Vandavasi to Arani Major District Road.

3.0 PROJECT DESCRIPTION

3.1 Land

Land measuring 13.45 acres for the proposed site has been purchased in Ayalvadi Village (Survey Nos.12/1, 13/2 B, 11/1), Pernamallur block, Vandavasi taluk, Tiruvannamali District, Tamilnadu which is on the Vandavasi to Arani Major District Road.

Table - 1 Details of Project

S.No.	Description	Area (Sq.m)
1.	Total Land Area	54,634 Sq.m
2.	Plant Area	4,500 Sq.m
3.	Fuel Storage Area	5,000 Sq.m
4.	Internal Roads Area	4200 Sq.m
5.	Area of the green belt	13,700 Sq.m

3.2 Water

Water is required for both construction as well as operation of plant, the requirement is given below.

Construction (50 m^3/day) - Source from wells within the project site.

Operation (63.5 m^3/day) - Source from wells within the project site.

3.3 Fuel

The bio-mass fuel like Ground shell, Sugarcane trash, Paddy straw, Rice Husk, Coconut shell, Maize stalk, cotton stalk, sun flower stalk, etc., required for the project are available within the radius of 50 kms., from the proposed site, in huge quantity, in addition to availability of waste lands where energy plantation can be developed.

3.4 Fuel Transportation

Fuel will be supplied by local suppliers through trucks and the same will be fed to the Boilers with the help of Conveyors.

3.5 Power Utilization

Power generated from the plant will be evacuated to the TNEB grid through the nearby 33 kV sub-station through an independent single circuit 33 kV overhead line from the proposed site. The sub-station is a 33 / 11 kV switching and step down sub-station and is located at about 10 km from the power plant site.

3.6 General features of the power plant:

The boiler will be of traveling grate type, suitable for firing bio-mass fuels under consideration. The salient features of boiler unit include furnace super heater, Economiser, steam and mud drums and air Preheater. The steam generated from the boiler will drive a steam turbine coupled to an electric generator. The power generated will be evacuated to the nearest sub station.

Steam from the turbine will be condensed in a air cooled condenser and the condensate will be supplied to the Deaerator by means of a condensate extraction pump. The Deaerator will remove oxygen and non-condensable from the condensate. The condensate is heated by the steam supplied from turbine bleed. The preheated condensate will be stored in the de-aerator water tank which is an integral unit of Deaerator.

The feed water will be pumped back to the boiler by means of a boiler feed pump. The Deaerator is supplied with Demineralised make-up water to make-up the feed water loss from the system due to blow down and leakage. A suitable capacity Demineralised water plant will be provided for the supply of make-up water. The cooling water for the auxiliary cooling tower will be supplied by small cooling water system. The turbo generator unit will be provided with all necessary

auxiliary equipment including condensate pump, ejectors, gland steam condenser, ejector condenser etc.

A pressure reducing and de-superheating station (PRDS) will be provided to supply steam to the Deaerator and also to the turbo generator ejectors and gland sealing during start up.

3.7 Auxiliary Systems

Auxiliary systems for the power station like ash handling plants, plant water, compressed air, ventilation and air conditioning systems. The proposed Power station will be provided with the state-of-the-art Distributed Digital Control System (DCS), which will integrate various open loop sub-systems, monitoring and information sub-system covering the entire plant.

3.8 Project Implementation & Monitoring

This Project is proposed to be commissioned in a period of about 1 ½ years. All administrative and financial formalities will be completed before the work starts. The project schedule with various proposed activities are given in DPR. The project is envisaged to be executed on total EPC basis.

3.9 Project Cost

Total Project cost	Rs. 36.35 Crores
Excluding Interest During Construction	Rs. 34.76 Crores
Excluding Interest During Construction & Margin Money	Rs. 34.52 Crores

4.0 DESCRIPTION OF THE ENVIRONMENT

4.1 Environmental Impact Assessment (EIA)

In order to identify the environmental impacts due to the construction and operation of the project and associated facilities, an Environmental Impact assessment study has been undertaken. The study area for EIA comprises 10 Km radius around the proposed site.

4.2 Baseline Environmental Scenario

The baseline environmental status for various environmental attributes were carried out during the months of July 2008 to September 2008 within the study area has been established through field monitoring supported by data from secondary sources.

Temperature : Max 36.5°C, Min 25°C

Relative Humidity : 61% to 88 %

Wind speed : 1.5 to 10 m/s.

Predominant wind direction from South West to North East during monsoon & normally from East to West.

The details of the base line study are presented as follows:

Table -2 Details of Sampling Locations for Air, Water, Soil and Noise

Station Code	Name of the Station	Distance w.r.to Project Site
1	Project Site	---
2	Eramalur Village	1 km
3	Aaraasur Village	3 km
4	Marudadu	4 km
5	Thellar Village	6 km
6	Vazhur Village	8 km
7	Koothampattu	9 km

4.3 Soil Characteristics

4.3.1 Data Generation

The physicochemical and nutrient characteristics of the soil were monitored from July 2008 to September 2008 at 7 locations in the study area. At each location, soil samples were collected from three different depths viz 30 cm, 60 cm and 100 cm below the surface.

4.3.2 Baseline Soil Status

It has been observed that the pH varies from 6.28-6.69 including that the soil is mostly neutral the conductivity varies from 80 to 124 micromhos respectively The

average concentrations of nitrogen, phosphorous and potassium are 0.36 to 0.48%, 0.3 to 0.36% and 0.02% to 0.03% respectively. The average sodium absorption ratio is 0.0053, which is much below the value 9 and hence the permeability of the soil does not get affected.

4.4 Ambient Air Quality

4.4.1 Data Generation

The prime objective of the baseline air monitoring is to evaluate the existing air quality of the study 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 stations were set up at seven locations.

4.4.2 Observations on Primary Data

The observations based on the results are summarized below:

SPM: A maximum value of 105 µg/m^3 for SPM was observed at Aaraasur Village (AAQ-3). All the observed values are within the prescribed limits. The 24 hours applicable limit is 200 µg/m^3 for residential areas.

RPM: The maximum value 65 µg/m^3 for RPM which was observed in Marudadu Village (AAQ-4). The next highest RPM value was 58 µg/m^3 which was observed in Aaraasur Village (AAQ-3). The 24 hours applicable limit is 100 µg/m^3 for residential areas.

SO_2: The higher values of SO_2 are observed to be 12.8 µg/m^3 at Aaraasur Village (AAQ- 3) and the next highest was 12.3 µg/m^3 at Marudadu Village (AAQ- 4). The 24 hours applicable limit for residential area is 80 µg/m^3

NOx: The higher values of NOx were observed to be 12.7 µg/m^3 at Marudadu Village (AAQ-4). The next highest NOx value of 12.2 µg/m^3 was observed at Project Site (AAQ-1). The 24 hours applicable limit is 80 µg/m^3 for residential areas.

4.5 Water Quality

4.5.1 Data Generation

Water Samples were collected from seven sampling locations. The groundwater analysis results are compared with the standards for drinking water as per IS: 10500-1983 "Specification for drinking Water" for ground water.

4.5.2 Presentation of Results

The analysis of the results indicate that the average pH ranges between 6.5-7.18. TDS ranges from 240-480 mg/l. Total hardness ranges from 46-139 mg/l. The Electrical Conductivity was observed to be in the range of 263-430 Micromhos/ cm. The chloride values ranges from 65-89 mg/l.

4.6 Noise Level Survey

The main 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. Seven locations were monitored for assessing the existing noise levels in and around the project site.

4.6.1 Day time noise levels

Noise levels during day time were found to be in the range 48.8 - 40.0 dB (A). The maximum noise level was observed to be 48.8 dB (A) at Aaraasur Village and a minimum of 40.0 dB (A) was observed at Eramalur.

4.6.2 Night time noise levels

Noise levels were observed to fall in the range of 37.3- 42.5 dB (A) during the night time. A maximum of 42.5 dB (A) was observed at Aaraasur Village and a minimum of 37.3 dB (A) was observed at Vazhur.

4.7 Demography and Socio-economics

A Socio Economical survey of Villages located around the proposed Project has been carried out. The total population of this Ayalavadi village is 894 comprising

of 435 Men and 459 women as per 2001 census. The SC population is 395 and ST population is not available. The total literate among male are 307 and that of female are 212.

4.8 Ecology

The study of terrestrial ecology within the study area of 10 km radius has been carried out through field investigation. The dry tropical vegetation exists in the study area. The study area is devoid of any natural forest. The study area harbours mainly domestic animals and it does not harbour any wild life of importance due to human settlement, increase in population and clearing of wild flora for making cultivable land. Some reptiles, amphibians and bird species were observed in the study area.

5.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Air Environment

Air pollution modeling, carried out for proposed power plant shows that incremental concentrations of SO_2, NOx and SPM due to the proposed project are such that the resultant concentrations will remain well within the National Ambient Air Quality Standards.

5.1.1 Air Dispersion Modeling

In the present case, the Industrial Source Complex - Short Term regulatory air dispersion model (ISCST3) is a Gaussian plume model and is widely used to assess pollution concentration and/or deposition flux on receptors from a wide variety of sources. The modeling results are presented below.

Table 3.1 Incremental GLC's Due To Proposed Project

Pollutant	Incremental Concentration-1Km Distance ($\mu g/m^3$)	Incremental Concentration-5Km Distance ($\mu g/m^3$)	Incremental Concentration-10 Km Distance ($\mu g/m^3$)
SPM	0.97	0.013	0.008
SO_2	1.89	0.051	2.4×10^{-3}
NOx	2.13	0.085	0.011

Table-3.2 Resultant Concentrations Due To Incremental GLCs

Pollutant	98 Percentile AAQConcentration recorded during study period ($\mu g/m^3$)	Incremental Concentration due to the Proposed Power Project ($\mu g/m^3$)	Resultant Concentration ($\mu g/m^3$)	CPCB Standards Industrial/ Residential ($\mu g/m^3$)
1 km from the Project Site				
SPM	104	0.97	104.97	500/200
SO_2	10.8	1.89	12.69	120/80
NOx	12.2	2.13	14.33	120/80

5.1.2 Air Pollution Control Systems

Since the proposed project is a bio-mass based power plant, there will not be a significant impact in air environment. The following measures have been envisaged for control of air pollution:

1. High efficiency ESP's to limit SPM emission.
2. The 50 meter high single flue stack - discharging particulate matters, toxic gases (namely SO_2 and NOx) & heat.
3. Green belt around the plant and plantation in all available spaces within the project site.

5.2 Water Environment

The project will source its entire water requirement from the well located within the project site. The total water requirement for the project is 63.5 m^3/day. Liquid Effluent generated is treated by RO process and the water balance is based on Minimal Discharge Concept. Hence there will not be any impact on ground water.

It is also proposed to adopt rain water harvesting scheme which will help in reducing the water consumption during rainy season and also reduce the cost of water treatment. The waste water from vehicle and construction equipment maintenance

centre will contribute oil and grease concentration. Treated sewage Effluent is fully utilized for green belt development.

5.3 Solid Waste Management

Major portion of solid waste produced in the proposed power station is only ash. Both bottom ash and Fly ash are collected in dedicated Silos through suitable conveying systems. Facilities are made available to dispose the ash from the silos through special trucks for use in the cement plants. **Industry has planned for 100% ash utilization from day one operation.** The solid waste from STP will be used as manure for the green belt area. The sludge from the evaporator will be disposed to suitable location/TSDF.

5.4 Noise Environment

The main noise generating sources are boilers and turbines. The impact of noise emission from boilers will be minimized by acoustic enclosures and the noise levels will be limited to 85 dB [A]. In order to control the noise pollution from the project, reduction in noise levels shall be achieved through,

- Proper lay out design of the buildings and plant area.
- Provision of earplugs and earmuffs to workers
- Provision of silencers for generators &turbines
- Good maintenance of vehicles and construction equipment
- Provision of green belt and afforestation will further help in reducing the noise levels.
- Equipment will conform to noise levels prescribed by regulatory authorities.

5.5 Greenbelt Development

For maintaining the ecological balance, dust control and to mitigate noise pollution, greenery is proposed to be developed to the maximum extent as permitted by the layout along the proposed plant boundary. Green belt to be proposed at an extent of 13,700 Sq.m will be created at important locations as marked in the plot plan.

5.6 Socio- Economics

The major economic impacts during the construction and operation phase is that, increased availability of direct and indirect employment. Local people will be benefited after commissioning of the proposed project in terms of petty to major contractual jobs and associated business establishments.

5.7 Rehabilitation and Resettlement Plan

No need of rehabilitation and resettlement as the project site is a barren land and no near by villages get affected by the project.

5.8 Ecological Management

To minimize the impact on the ecology development of green belt will be started along with the construction activities.

6.0 ENVIRONMENTAL MONITORING PROGRAMME

Post project environmental monitoring is important in terms of evaluating the performance of pollution control equipments installed in the project. The sampling and analysis of the environmental attributes will be as per the guidelines of CPCB/TNPCB. The number of sampling stations in each of these disciplines, frequency of sampling and parameters to be analyzed, in and around the project site are presented below:

Table-4 Environmental Monitoring Programme

S. No	Area of Monitoring	Number of Sampling Stations.	Frequency of Sampling	Parameters to be analysed	Monitoring Cost (Rs)
1	Meteorology	One Station - Automatic	Hourly and Daily basis.	Wind speed and direction, Temperature, Relative Humidity, Atmospheric pressure, Rainfall.	900
2	Ambient Air Quality	4 Stations	Twice a week:24 hourly period	SPM, RPM, SO_2 and NOx	1500 /sample
3	Noise	5 (two within plant premises and three outside plant premises)	Once every season	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Nighttime.	500 /location
4	Stack Emission	All the Stacks	Once a fortnight	SPM, SO_2 and NOx	

	Liquid	Main Plant	Monthly	pH, Temp	800/sample
5	Effluents	Effluents		Conductivity, TSS, TDS, BOD, O&G, Phenolics.	
			Quarterly	Heavy Metals	4000 /sample
		Sanitary Effluents	Monthly	pH, TSS, BOD	400 /sample
6	Water Quality	Ground Water (Well)	Quarterly	pH, Temp, Conductivity, TSS, TDS, BOD, O&G Heavy metals	4800 /sample
7	Soil	Around the Ash Disposal area and close to Air monitoring stations.	Once in three years	Physicochemical properties, Nutrients, Heavy metals	6,500 /sample
8	Terrestrial Ecology	Within 10km, around the project	Once in three years	Symptoms of injuries on plants	5000

7.0 ADDITIONAL STUDIES

7.1 Occupational Health and Safety Plan

As a part of the EIA, this aspect has also been studied in detail and an occupational health and safety plan has been recommended for implementation at site. During the construction phase, the main areas of concern are control of air and noise pollution, precautions associated with storage and handling of hazardous materials and safety measures for prevention of accidents. It is recommended that adequate pollution control and sanitation facilities, emergency medical facilities and safety equipment should be provided during construction phase.

During the operation and maintenance phase accidents, exposure to heat, dust and noise, exposure to hazardous chemicals and gases are the prime considerations. It is

recommended that suitable personnel protective equipment should be provided to all the employees likely to be exposed to these conditions.

7.2 Disaster Management Plan (DMP)

The EIA Report includes a DMP covering elements of emergency planning like organization, communication, coordination, procedure, accident reporting, safety review checklist, on-site emergency plan and off-site emergency plan. The On-site and Off-site Emergency Plans recommend various Preventive and Predictive Systems, Protective Systems including Site Controller, Incident Controller and Coordinators. Personnel Protective Equipment to be deployed at site, Control Systems, Mock Drill and Simulation Exercises, Mutual Aid Schemes, Procedures for Communications, Medical Facilities to be provided and Procedure for Reporting to External Agencies.

8.0 PROJECT BENEFITS

The basic amenities like education, medical, drinking water, approach roads, etc., are well within the buffer zone. Both construction and operation phase will provide direct employment opportunities.

9.0 ENVIRONMENT MANAGEMENT PLAN

The Environmental Management Plan (EMP) for the proposed power plant has to ensure that the residual environmental impacts are minimized, by adopting best possible economically viable techniques. The EMP also has to ascertain compliance with all statutory conditions as per No Objection Certificate (NOC) from Tamilnadu State Pollution control Board and Ministry of Environment & Forests.

9.1 Environmental Management for Construction Phase

Environmental impacts during the construction phase can be attributed to the site preparation activity and the mobilization of workforce. The potential for environmental pollution during construction phase is less and temporary than the operation phase of the plant.

The construction activities typical for a project of this size include following major operations:

- Site preparation and soil consolidation
- Roads, temporary and permanent
- Foundations and structures
- Pipes crossings
- Process unit erections

The Environmental Management Plan for the construction phase is described below:

1. Water will be sprinkled in the vulnerable areas to suppress the dust generated during excavation, leveling and other operations.
2. The effluents from construction area will be channeled through sedimentation tanks to remove suspended solids.
3. Safety equipment such as earplugs and earmuffs, helmets, face shields, safety goggles etc. will be provided to workers engaged in high risk areas.
4. A first aid center will be established to provide immediate medical aid to the workers and their family members. An ambulance will also be made available at site to transport injured workers to nearby hospitals.
5. Development of green belt will be started along with the construction activities itself.
6. Construction activity will be restricted to daytime as far as possible to avoid disturbance to surrounding areas.

9.2 Environmental Management Plan for Operational Phase

At the operational phase, there are several measures proposed to be incorporated in the process so as to minimize the environmental impacts of the power plant. The environmental impacts could be moderated to the minimum possible level during operational phase, with strict adherence to the pollution prevention and control measures. The Environmental Management Plan during operational phase of the plant shall be directed to the following:

1. It should be ensured that all the pollution control/ environment management systems are commissioned as a part of main plant equipment, before the commencement of operation of the project.
2. Regular monitoring for various components of environment should be undertaken to ensure effective functioning of pollution control measures as well as to safeguard against any unforeseen changes in environment.
3. The recommendations for Disaster Management Plan Occupational Health and Safety Plan should also be implemented along with the commissioning of the project.
4. The effluent from the project should be utilized for the green belt development and afforestation purposes after proper treatment and made sure the quality of the treated waste water meets the gardening standards.
5. Since the water balance for the proposed project is based on Minimal Discharge Concept there will not be any outfall of the treated process water.
6. The efforts will be made to dispose 100% ash for some constructive utilization

9.3 Green Belt Development

The green belt has been recommended as one of the major components of the EMP which will further enhance the environmental quality through:

- Mitigation of air pollution problems
- Attenuation of noise level
- Maintain the bio diversity of the area and improve aesthetics.

10.0 SALIENT FEATURE OF THE PROJECT

- **25 % of the project area is exclusively earmarked for green belt development.**
- **ESP with 99.9% dust removal efficiency to limit the particulate emission.**
- **100% ash disposal/utilization from the day one operation.**
- **Minimal discharge of Treated Water.**
- **Treated sewage effluent is fully utilized for green belt development.**

- **Provision of on-line continuous Stack gas analyzer to monitor the stack emissions.**
- **Provision of on-line continuous Ambient Air Quality monitoring station to monitor ground level air quality.**
- **Rainwater harvesting arrangements to reduce water consumption.**
- **Acoustic enclosures are provided in DG room to reduce noise level.**

11.0 CONCLUSION

Assessment of impacts due to various emissions and discharges from the proposed power plant indicate that the environmental quality will remain within the stipulated standards even after commissioning and operation of the project. All the impacts due to construction and operation of the project shall be mitigated by adopting state-of-the art technologies and management systems. In addition, the benefits of the project in terms of power generations, utilization of barren land, improvement of living standards of the local population, improvements in infrastructure etc. will add to the positive impacts of the project.

Fig E.1 Vicinity map for 10 Km of the Project site

Fig E.2 Plant Layout