CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

TCP - 9 MW Renewable Energy Grid Connected Biomass Power Project
Version : 1
Dated : 7th March 2007

A.2. Description of the small-scale project activity:

The proposed biomass based renewable energy power project is promoted by TCP Limited adjacent to its Karaikudi Sodium Hydrosulphite manufacturing unit. The power plant will be commissioned in one of the notified backward area, located in the southern part of Tamil Nadu. The annual manufacturing capacity of the chemical plant is 4600 MTs and production process is through the unique Sodium Format Route. TCP Limited (herein further referred as project promoter) conceived this project activity to generate eco friendly power by commissioning 9 MW installed capacity biomass power plant. Power plant will be constructed in two phases with capacities of 6 MW in the phase I and 3 MW in the phase II. The power plant is estimated to produce about 63.02 MU annually, of which 62.44 MU will be exported to TNEB grid, after meeting the auxiliary power requirements (0.630 MU). The power plant will operate with one biomass based stoker fired boiler with 6 MW extraction cum condensing steam turbine an inlet pressure of 64 ata @ 480 C and one 3 MW condensing steam turbine. The power plant will run essentially through Prosopis Juliflora available surplus in the region. As the biomass based power is CO_2 neutral, power produced will have zero emissions and will be replacing fossil fuel based power generation by TNEB.

In the absence of the project activity, equivalent power would have been generated and consumed based on the fossil fuel intensive grid resulting in Green House Gas emissions into the atmosphere. Hence, the implementation of this project activity will facilitate in reduction of the ever increasing demand and supply gap of electricity through biomass based power generation and result in 53,075 tonnes of GHG emission reductions, annually.

In addition, the project activity will lead to the other sustainable development benefits in the project location as mentioned in section A 4.2.

A.3. Project participants:

Name of party involved ((host) indicates a host party)	Private and/or Public entity (ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant

India (host)	TCP Limited	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

India

A.4.1.2. Region/State/Province etc.:

Tamil Nadu

A.4.1.3. City/Town/Community etc:

Village : Kovillur
Taluk : Karaikudi
Disrict : Sivagangai

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project site is located at Kovillur Village in Karaikudi Taluk in Sivagangai District of Tamil Nadu. The nearest town is Madurai which is easily reachable by air, rail and road.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The proposed project activity is of 9 MW installed capacity which is less than the prescribed limit of UNFCCC modalities and procedures of small-scale CDM project activity.

Since the project is "biomass based renewable energy power generation activity" it will fall under Type-I activity and the following categories. The project is a biomass based power plant employed with high efficiency boiler and a high-pressure steam turbine-generator of an installed capacity of 9 MW.

According to the Small Scale CDM modalities the project activity falls under:

Type	Sub Group	Sectoral Scope
I – Renewable Energy Project	D - Renewable Electricity Generation for a Grid Version – 10	1

Project Technology Description

1. The project promoter proposes to implement the proposed 9 MW Biomass based Power Plant fed by Prosopis Juliflora as the main feedstock and Coconut Residues, Groundnut Shell and Sugarcane Trash as secondary fuel.

2. The project employs the Rankine Cycle technology for high-pressure steam generation based on direct combustion and single extraction condensing turbine for power generation. Renewable biomass is burnt as a fuel in a traveling grate combustion steam generator to produce high-pressure steam, which is then expanded in a steam turbine to generate power.

3. The project will have one biomass stoker fired, bi-drum and natural circulation boiler of 45 tph, 66 ata, 485 C. The combustion system of the boiler is traveling grate with spreader stoker for combustion.

4. In phase I (April 2007) one extraction cum condensing steam turbine of nominal capacity of 6 MW is installed and in the phase II (April 2008) another condensing steam turbine of nominal capacity of 3 MW is installed.

5. The steam inlet pressure at the inlet of the turbine will be 64 ata at 480 C. The turbine will be an extraction cum condensing type and running at a high speed and operating at 1500 rpm.

6. The project installs an air cooled condenser system which is installed for condensing the exhaust steam from turbine.

7. The fuel for the biomass power plant is Prosopis Juliflora which will be conveyed to the boiler by a combination of belt and chain slat conveyers. The system shall have the provision for returning the excess fuel to the storage yard from boiler. The fuel handling system shall be designed for a capacity of 15 TPH.

8. The major biomass considered for the power plant is Prosopis Juliflora, Coconut Residues, Groundnut Shell and Sugarcane Trash. As per the Annex 18 of EB 23, the above biomass falls under the category of Renewable Biomass.

9. The power generated will be evacuated from the 110 kV switchyard located within the plant by transmission line connecting to the nearest TNEB sub-station.

10. The power plant is estimated to produce about 62.15 MU annually, of which 62.44 MU will be exported to TNEB grid, after meeting the auxiliary power requirements 0.630 MU.

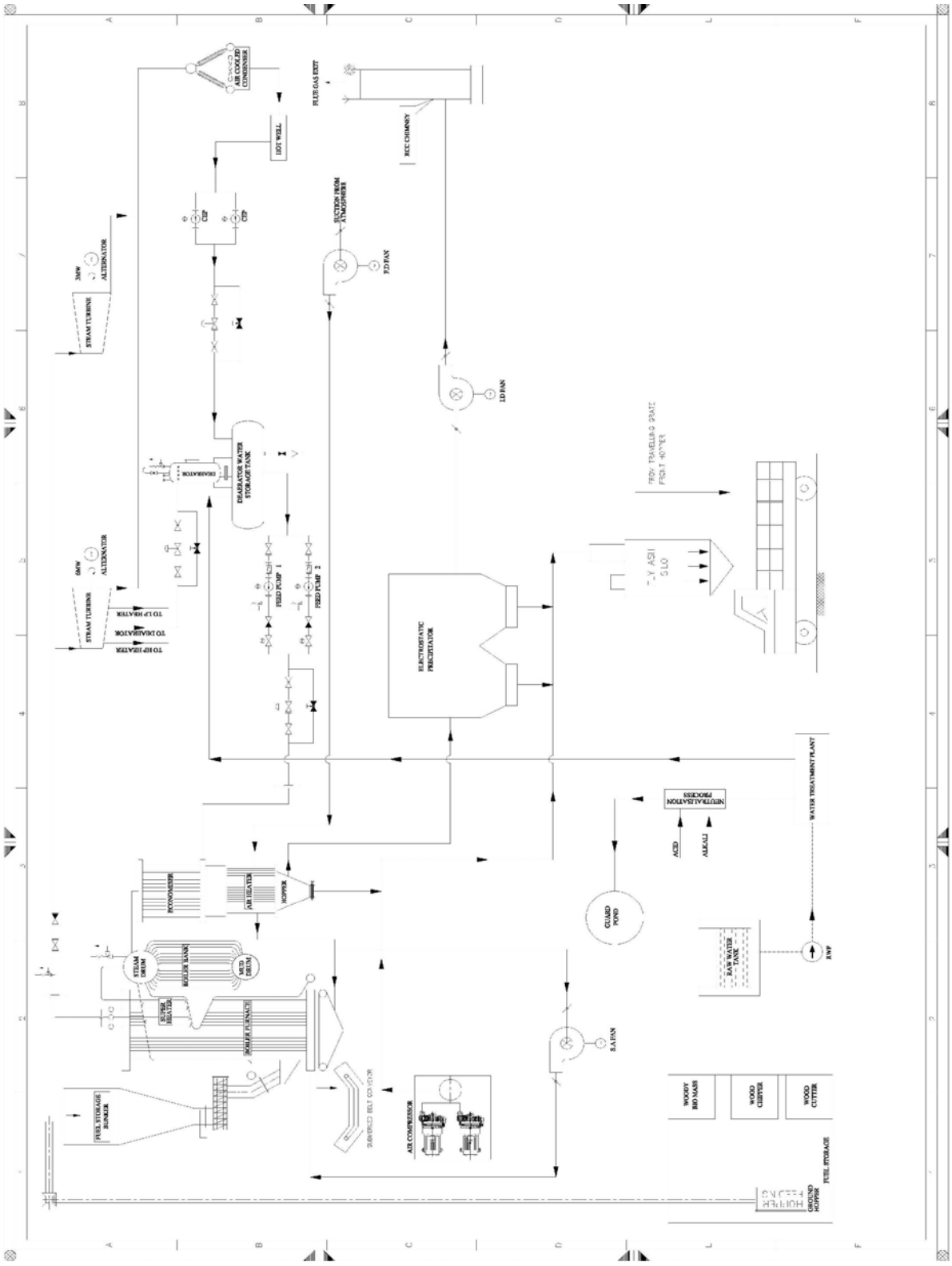
11. The plant's instrumentation and control system is based on Distributed Control System, designed to provide monitoring and control capabilities with complete safe and reliable operation minimize operator manual actions and alert operators to any conditions or situations requiring manual intervention in a timely manner.

12. The plant will be equipped with all needed equipments for continuous monitoring of environmental parameters. Ash handling system will be provided to collect the ash generated in the Biomass power plant and the collected ash will be used as manure by the farmers and also in the road building industry. The ash handling system envisaged for the biomass plant is of two types; submerged scrapper conveyor for grate ash and dense phase pneumatic conveyor for fly ash.

Biomass

There is no formal government published biomass assessment study report are available in Sivagangai district. Hence the project promoter conducted a detailed biomass assessment study in Sivgangai district to asses the biomass availability in the region. Five taluks within 25 Kms of radius have been identified and the study shows biomasses is available surplus in the region and are Prosopis Juliflora, Coconut Residues, Groundnut Shell and Sugarcane Trash.

The quantum of biomass required for this project is about 102,007 Ton/year. The surplus availability of biomass within 25 kms (with in Sivagangai district) from the project site is estimated as 119,280 tons per year.


AIR COOLED CONDENSER
FLUE GAS EXIT
TRIM DUCT
SUCTION FROM ATMOSPHERE
ID FAN
CIP
CIP
6MW
ALTERNATOR
STEAM TURBINE
DEAERATOR
DEAERATOR WATER STORAGE TANK
FEED PUMP 1
FEED PUMP 2
TO HP HEATER
TO DEAERATOR
TO LP HEATER
6MW
ALTERNATOR
STEAM TURBINE
ELECTROSTATIC PRECIPITATOR
FROM TRAVELLING GRATE FIGHT HOPPER
NEUTRALISATION PROCESS
ACID
ALKALI
WATER TREATMENT PLANT
RAW WATER TANK
JMS
GUARD POND
ECONOMISER
AIR HEATER
HOPPER
STEAM DRUM
BOILER BANKS
MUD DRUM
SUPER HEATER
BOILER FURNACE
SECONDARY AIR DUCT
FUEL STORAGE BUNKER
AIR COMPRESSOR
SA FAN
WOODY BIO MASS
WOOD CHIPPER
WOOD CUTTER
HOPPER
GROUND HOPPER
FUEL STORAGE

Project activities contribution to sustainable development

- The project is located in the rural area and will contribute sustainable development in the project region.
- The project's contribution to Sustainable Development is substantiated in the following statements, based on Social, Economic, Environmental and Technological parameters

Project's contribution to Social Well being

- This project is located in the rural area and the project assists the local population by providing employment to both skilled and unskilled labors for biomass supply and regular operation and maintenance of the plant.
- Improvement in power availability.
- Local manpower are trained to operate the new technology
- Development of the region is expected due to the implementation of project in rural area

Project's contribution to Economic Wellbeing

- This project increases the income of the surrounding population by providing direct and indirect employment to them.
- The project will also provide economic value for agricultural and woody wastes and provides stable power to the neighboring industries, farmers and households.
- This project will address the electric deficit supply in Tamil Nadu.
- The project is providing business opportunity to the local biomass suppliers and farmers.
- At a national level, use of surplus biomass as a renewable energy resource for generation of grid quality power help conserve foreign exchange by reducing the need to import fossil fuels to meet the country's growing energy demand

Project's contribution to Environmental Well being

- Renewable biomass is used as a fuel and hence Green House Gases emissions are reduced
- Combustion of biomass in the proposed project does not result in net increase in GHG emissions of CO2, CH4 and NOx. While the CO2 forms the major constituent of GHG emissions with about 98%, CH4 and NOx constitute the remaining 2% based on the typical ultimate analysis of biomass materials. Though CO2 is considered as the only GHG emissions from the biomass combustion, biomass is considered to be CO2 neutral fuel due to their life cycle emissions.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

S.No.	Year	Phase I – 6 MW Biomass based Power Generation	Phase II - 3 MW Biomass based Power Generation	Emission Reduction (tCO2)
1	2007	28,113	-	28,113
2	2008	35,383	12,239	47,622
3	2009	35,383	17,692	53,075

4	2010	35,383	17,692	53,075
5	2011	35,383	17,692	53,075
6	2012	35,383	17,692	53,075
7	2013	35,383	17,692	53,075
Total CERs in the 1st crediting period				**341,110**
Total number of crediting years				**7 Years**
Annual average over the crediting period of estimated reductions (tons of CO_2)				**53,075**

Plant load factor < 80 %

A.4.4. Public funding of the small-scale project activity:

All the funds involved for implementation of the project will be arranged by the project promoter and there is no public funding involved for implementation of this project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The proposed project is the first CDM project implemented by the project promoter and it is not a de-bundled component of a large project as there is no registered small scale CDM project activity:

- by the same project proponent.
- in the same project category.
- registered within the last 2 years.
- where the boundary is within 1 km of the project boundary.

Therefore as stated in the Annex C of the Simplified M&P for Small Scale projects, this is not a debundled component of a larger project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

Project Type : I - Renewable Energy Projects
The proposed "9 MW Biomass based Power Project" is a renewable energy (power) generation project with an installed capacity less than 15 MW. Hence it falls under the simplified modalities and procedures for small - scale CDM project activities.

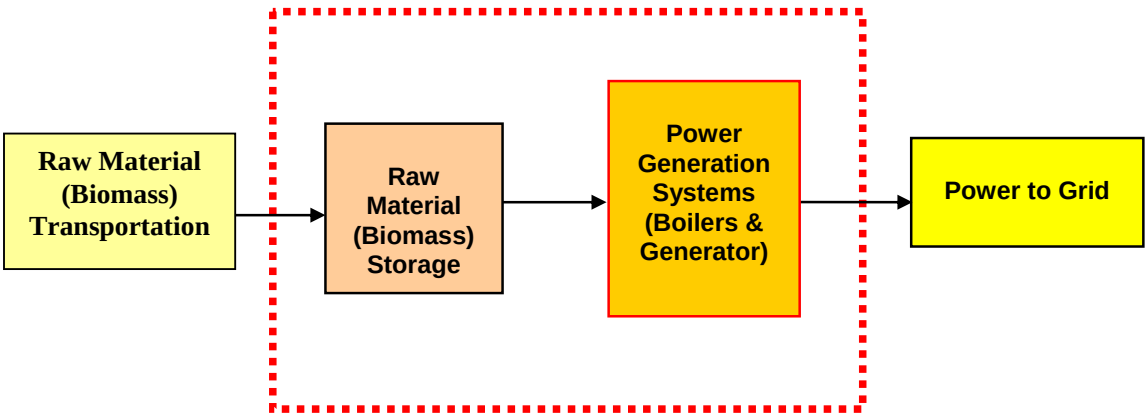
The project promoter through this project activity generates power using renewable biomass and exports the same power to grid.

The generated electricity from the renewable biomass resource is supplied to the grid and thus will be displacing the fossil fuel dominated grid power and hence the project falls under the small scale Type I.D methodology, grid connected renewable electricity generation, version 10.

B.2 Justification of the choice of the project category:

Category	Applicability Criteria	Project Activity
I – D Version - 10	The project activity primarily aims at generating power from renewable source to supply/displace electricity from a distribution system supplied by at least one fossil fuel fired generation system.	The project will generate power from renewable biomass and displace electricity consumption from the grid, which is primarily fed by fossil fuel based sources.
	The renewable component should not generate more than 15MW power.	The project installed capacity is 9 MW of power.

B.3. Description of the project boundary:



B.4. Description of baseline and its development:

Baseline Estimation

As prescribed in small scale Type I: D baseline methodology, the emission baseline will be the kWh produced / displaced by the renewable generating unit multiplied by an emission coefficient of the grid (measured in kg CO_2 equ/kWh) calculated in a transparent and conservative manner.

The grid emission coefficient was calculated based on the combined margin method consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Thus baseline emission reductions for this project activity will be the amount of electricity (kWh) produced and the associated equivalent amount electrical units displaced from the grid multiplied with the emission coefficient of the southern grid from which power will be displaced.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The proposed biomass power plant operates with a biomass based stoker fired boiler with one extraction cum condensing steam turbine of capacity 6 MW and one condensing steam turbine of capacity 3 MW respectively, with an inlet pressure of 64 ata @ 480 C. The power plant will run essentially based on Prosopis Juliflora, available in surplus in the region. As the biomass based power is CO2 neutral, power produced will have zero emissions and will be replacing fossil fuel based power generation by TNEB and the generated power will be supplied to the grid.

In the absence of the project activity, 62.44 MU of power would be generated by the power plants connected with in the southern grid, dominated by the fossil fuel which will result in generation of GHG emissions into the atmosphere. Also, the implementation of this project activity will address and facilitate reducing the ever increasing demand and supply gap of electricity through biomass based power generation.

For the first crediting period of 7 years, the total GHG emission reductions from the project activity would be 341,110 t CO2 eq based on an annual generation of 62.44 Million units of supply to grid.

Grid System

The project is commissioned in the southern state of Tamil Nadu which is synchronized with the southern regional electrical grid system of India. With this proposed biomass power system about 62.44 Million Units will be displaced annually from southern grid, which is currently dominated by fossil fuel based power generation.

The total installed power capacity of southern grid as on March 2006 is 30,508 is MW and the capacity addition planned in tenth five year plan (2003 - 2007) and eleventh five year plan (2007 - 2012) is largely based on fossil fuel. The Ministry of Non-conventional Energy Sources (MNES) has targeted a 10% of the country's installed capacity in the year 2012, from renewables, accounting for 10,000 MW. The total installed capacity of Tamil Nadu renewable program as on March 2006 is 5363 MW, of which wind power (2898 MW & 55%) dominates in terms of the highest installed capacity followed by hydro power (2147 MW & 40%) and biomass power (33 MW & 5 %), including bagasse co-generation. The implementation of biomass based power projects is not a common practice in Tamil Nadu as compared to the neighboring states like Andhra Pradesh.

As illustrated in the above figures, thermal power generation is prevalent in the region and biomass based power generation is not a prevailing practice in the state.

PROJECT ADDITIONALITY JUSTIFICATION

As prescribed in simplified modalities and procedures of small scale CDM project activities, the project can demonstrate the additionality as per Attachment A to Appendix B. Various barriers are listed in the modalities and procedures, out of which, at least one barrier shall be identified due to which the project activity would not have occurred any way. Following are the barrier faced by the project promoter faced during the implementation of the project activity which is not a BAU activity.

1. Common Practice Analysis

For over a decade since 1994, grid connected biomass power projects have not been implemented regularly in the state of Tamil Nadu though the neighboring state namely Andhra Pradesh implemented them on an accelerated basis. The first grid connected biomass project to be commissioned in the state of Tamil Nadu was during 1997 with an installed capacity of 12 MW in Palayaseevaram (Kancheepuram District) based on the bagasse from the neighboring sugar mill. However due to the paucity of the bagasse, this power plant switched to other fuels, namely fuel wood based on Prosposis Juliflora. Besides the switch in the type of biomass for the project, this project faced several hardships related to poor evacuation schedules by the state utility due to less demand during the night period. Though this was the only power plant in the state of Tamil Nadu then, an overall policy for promotion of such grid connected biomass based power projects was not forthcoming from Tamil Nadu Energy Development Agency and Tamil Nadu Electricity Board. After a gap of several years, only two grid connected biomass power projects with installed capacity of 18 MW and 7.5 MW been recently commissioned in Tamil Nadu.

These two projects have been developed under the CDM. Thus as mentioned previously, against the total estimated potential of 670 MW from biomass, the installed capacity as on date has been only to the tune of 41.5 MW. Though recently licenses for biomass power projects totaling over 250 MW has been sanctioned by TEDA, only a few are being implemented. Hence implementation of grid connected biomass power project is not a common practice in the state of Tamil Nadu.

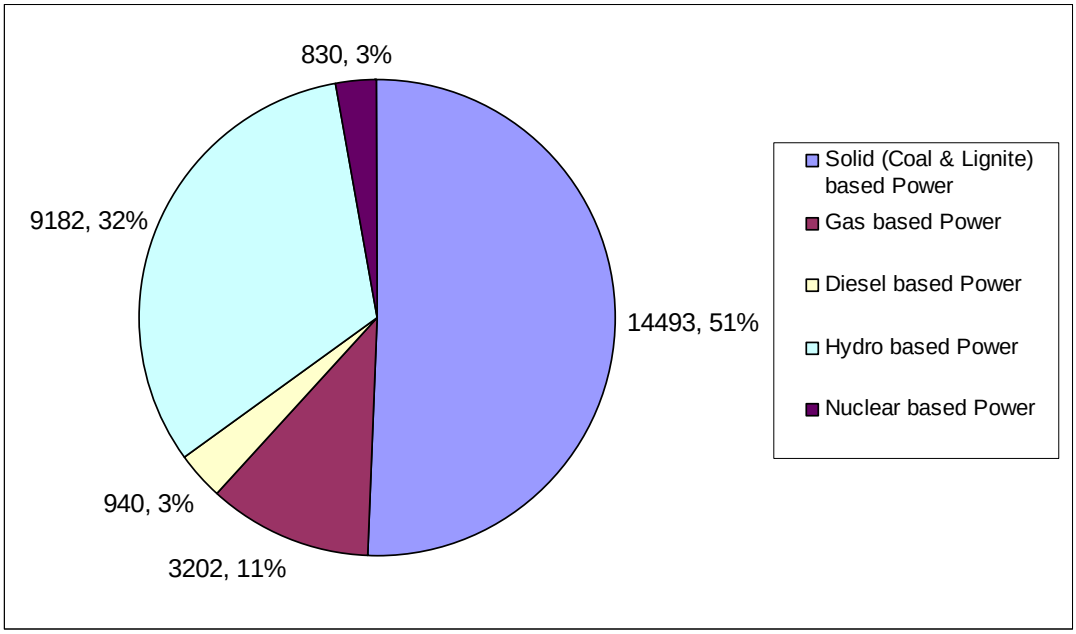


Figure 1. Percentage Installed (MW) capacity of Southern Grid System - as of March 2006[1]

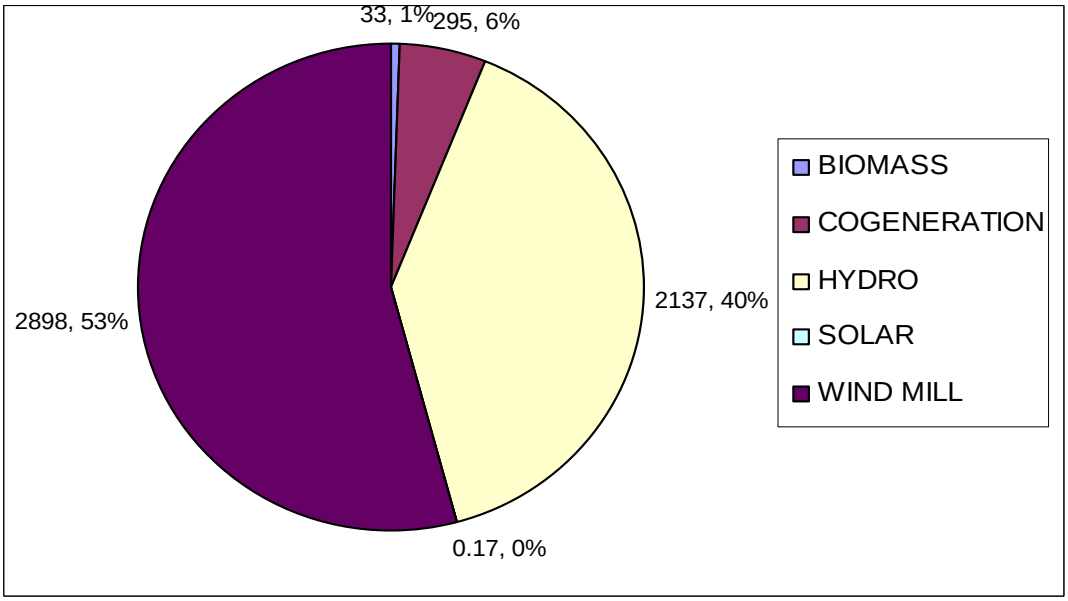


Figure 2. Percentage Renewable Energy Installed (MW) Capacity[2] **as of March 2006**

[1] CEA data as of March 2006

[2] http://www.tneb.in/installed_capacity.php

As mentioned earlier, the total installed capacity of Tamil Nadu renewable program is 5363 MW, of which wind power capacity (2898 MW & 55%) dominates in terms of the highest installed capacity followed by hydro power (2147 MW & 40%) and biomass power (33 MW & 5 %), including bagasse co-generation. The biomass based power projects is not a common practice in Tamil Nadu as compared to the neighboring states like Andhra Pradesh.

2. Barrier due to prevailing practice under policy

According to the Government Order (G.O) of TNEB, reference "Permanent B.P. (FB) No: 59, dated 11.4.2000", the price of electricity for any financial year after 1.4.2000 was fixed at INR 2.73 /kWh with 5% annual escalation for a period of nine years up to the year 2010 and the price shall not exceed 90% of the prevailing High Tension industrial tariff rate applicable for the industrial consumers which may get revised from time to time. The project proponent entered PPA with the state utility in the year 2004 based on this amendment.

Recently, TNERC came with power purchase issues in respect of Non-Conventional Energy Sources based generating plants through its order number 3 dated 15 May 2006, which states, power generated by biomass based power plants will be purchased by TNEB at a rate INR.3.15 per kWh. Also as per the Power Purchase Agreement, power to be drawn by the project for start-up purposes will attract High tension tariff added with monthly demand charges, to be notified by TNERC from time to time. This will also affect the overall cost of generation of power from the proposed project.

Thus the tariff policy for biomass power projects in Tamil Nadu is a key risk for the investor. During the month of August 2005, the TNERC has passed the order3 that the third party sale is allowed under the open access scheme as defined in the Indian Electricity Act 2003, within a time frame covering projects with specific capacities. The analysis of the other least cost and financially attractive and feasible options for implementing grid connected power plants and the Tamil Nadu state grid augmentation plan in terms of recent and planned implementation of power plants does not conclude in favour of implementation of grid connected biomass power plants.

Current investments in the power sector of the State of Tamil Nadu portrays the fact that majority of the power generation capacity has been added based on fossil fuels such as coal and gas which are feasible options, leading to high emissions. Thus in the absence of the proposed grid connected biomass power project activity, other and alternative investments would be made in coal or gas based power plants in Tamil Nadu resulting in high carbon intensity based power generation with more GHG emissions.

[3] http://tnerc.tn.nic.in/regulation/OpenAccess2005.pdf

3. Technology barriers

The Rankine cycle technology with the conventional cooling towers requires huge quantity of water. Generally, for a project of the proposed capacity (9 MW) the conventional cooling system is a common practice in India. It is estimated that a substantial quantity of water (about 35 m3/ hr or 8, 40,000 litres /day) is required for operating a conventional cooling system. Hence as an alternative, an air-cooled condenser (ACC) which is considered as a water conservation equipment (as it reduces use of water only for service applications), was found essential for the operation of the proposed plant. The cost of the air cooling system is about 3 to 4 times more than conventional water cooling system. The implication on cost is estimated as 4.95 Crores (0.55 Crores per MW) and increase in auxiliary power consumption by 2.5% and reduction in operational efficiency by 8%. Financial impact is indicated as increase in 6 p/ kWh in fixed cost and 20 p/kWh in variable cost at fuel cost of Rs. 1000 per ton. Further the ACC results in additional steam requirements at the turbine inlet and hence increased boiler rating. This has a spiralling effect leading to increased auxiliary power consumption, higher biomass consumption per MW and hence increased cost of generation. Due to this facts the project promoter is considering capital cost higher by 0.4 Crores per MW, auxiliary consumption as 12% after stabilization plus 0.5% extra during stabilization period and station heat rate as 4000 kcal/kWh+6% = 4240 kcal/kWh after stabilization and with 100 kcal/kWh extra for stabilization period. These norms are subject to being reset based on actual data after such plant become operational for 2-3 years. Thus, the addition of the air cooling system increases the capital investment cost and the operational costs of the project.

One of the significant barrier faced by the majority of the Renewable Energy based IPPs is the grid interconnection with the state utility. For Renewable Energy projects located at a distance from the grid due to access to Renewable Energy resources and in economically infeasible and industrially backward areas such as this proposed project, efforts in establishing the infrastructure for grid connection results in an additional capital investment. While the project promoter is not comfortable in this co-investment, the TNEB may not be comfortable in establishing additional infrastructure for a small capacity project. Further the small capacities associated with typical rural electricity transmission and distribution system (for the small electricity consumption of the rural areas) pose poor grid availability problems and stability problems (for remote areas) leading to fluctuations and grid failure which will reduce the power evacuated from the biomass power project and hence affect the plant load factor.

4. Other barriers

The project is located in Karaikudi, Sivagangai district of Tamil Nadu state. This district is one of the backward districts in India meaning that the district is under developed. The under development of the area can be attributed to the lack of sufficient natural resources even though only surplus biomass is available for the power generation. Thus the area suffers from lack of investment and infrastructure currently aiding development. Despite such discouraging signals for the private sector, under this prevailing situation, the project promoters have decided to utilise the surplus biomass available for power generation and also contribute to the sustainable development of the area by providing and enhancing local employment and additional rural incomes.

In addition to the above barriers the uncertainties related to the major fuel for the power plant namely the biomass are briefly described below:

a. Availability of abundant biomass at affordable price dictates the successful operation of any biomass power plant as the overall operational performance mainly depends on the biomass materials. Biomass generation is normally related to the seasonal variation in the cropping patterns and hence invariably subjected to significant fluctuations with little or no human control over it. Thus, despite the biomass assessment study reporting the current surplus biomass availability in huge quantities, the projection and the actual generation for the future is linked with high degree of uncertainties. Hence biomass power plants carry more fuel related risk than the conventional thermal power plans depending on coal and gas.

b. Escalation in the price of biomass has always been historically high due to the perception of the farmers on its demand. Erratic increase in the price of biomass is obvious, even in case of pre-signed contracts biomass suppliers for a fixed price over a period of time. One of the other reasons for an increase in the biomass price is also attributed to the expected increase in price of biomass transportation cost due to increase in diesel price.

c. The nature of the biomass (physical and chemical properties) limits the flexibility in handling of the biomass during transportation, handling (loading and unloading), pre-processing and utilisation. Based on such limitations biomass management techniques will differ for different biomass and is a difficult and a costly affair.

d. Although the biomass availability is abundant but they do not have a proper network for collection and delivery. So to ensure proper and continuous fuel supply project proponents will have to develop fuel collection system. Also, project proponent has the problem of sourcing the biomass during rainy days.

5. Impact of CDM Registration

All the risks and the barriers associated with this project activity are described above and additional revenue from the sale of carbon credits will mitigate such risk factors to a greater extent of the proposed project.

Also the project is not a common practice in the state and as substantiated above. The proposed project is additional as the same not being implemented in the business as usual scenario.

Thus the barrier analysis as carried out above clearly indicates that in the absence of the CDM project activity the baseline scenario would have been implementation of GHG emissions intensive thermal power plants and hence the proposed grid connected biomass power plant is additional to the baseline scenario. Further the CDM revenues are critical since such revenues will be used to mitigate various risks as mentioned above.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Type: I.D. - Renewable energy technologies that displace electricity from an electricity distribution system.
Version – 10

Since the project is a grid connected renewable energy project, emission reduction quantity depends on the units of energy (generated only from biomass) exported to the grid (in kWh) and the baseline emission of the state grid. The methodology covers the monitoring of units exported and the other parameters affecting the quantity of power export and CO2 emissions thereof. The project fires biomass hence the methodology also includes monitoring the quantum of biomass input and their energy availability from the same. The net emission reductions will result from the units of power available from the biomass power plant exported to the grid.

Estimation of the emission reductions due the project activity = amount of electricity displaced from the grid multiplied with the grid emission co-efficient.

$$ER = \sum_n E_{WEG} * E\ Coeff_{grid}$$

$\sum_n E_{WEG}$ = Amount of electricity supplied to the grid

$E\ Coeff_{grid}$ = Grid Emission co-efficient

Grid Emission co-efficient = Combined margin of the Southern grid calculated as given below

$$E\ Coeff_{grid} = w_{OM} * EF\_OM_y + w_{BM} * EF\_BM_y$$

Where

EF_OM_y = emission factor of Operating Margin

EF_BM_y = emission factor of Build Margin

w_{OM} = weight factors of Operating Margin

w_{BM} = weight factors of Build Margin

with respective weight factors w_{OM} and w_{BM} (where $w_{OM} + w_{BM} = 1$), and by default, are weighted equally ($w_{OM} = w_{BM} = 0.5$).

The Operating Margin Emission Factor (EF_OM_y) is calculated based on the Grid Dispatch Data Analysis

Calculation of Grid Dispatch Data is given as follows

$$EF\_OMy = \frac{EOM,y}{EGy}$$

$$E\ OM,y = \sum EG_h * EF_{DD.h}$$

Where,

EG_h = generation of the project (in MWh) in each hour h

$EF_{DD,h}$ = hourly generation weighted average emissions per electricity unit (tCO2/MWh) of the set of power plants (n) in the top 10% of grid system dispatch order during hour h

$$EF_{DD,h} = \frac{\sum F_{i,n,h} * COEF_{i,n}}{\sum_n GEN_{n,h}}$$

F i ,j, y = amount of fuel i (in a mass or volume unit) consumed, by relevant power sources j, in year(s) y, j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports to the grid

COEF i, j y = CO_2 emission coefficient of fuel i (tCO2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y

GEN j, y = electricity (MWh) delivered to the grid by source j.

Build Margin emission factor (EF_{BM})

The Build Margin emission factor *EF_BMy* is given as the generation-weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most 20% of the generating units built (summation is over such plants specified by *k*):

$$EF\_BM_y = \frac{\sum_i F_{i,y} * COEF_i}{\sum_k GEN_{k,y}}$$

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	Amount of electricity supplied to the grid
Data unit:	GWh
Description:	Amount of electricity produced by biomass based power plant and supplied to the grid
Source of data used:	Net quantity of annual power generation from the project activity
Value applied:	62.44
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data will be monitored in the power plant as well as metered in the Tamil Nadu electricity board sub station (grid)
Any comment:	N/A

Data / Parameter:	Grid Emission factor *(Operating Margin)*
Data unit:	tCO_2/MWh
Description:	Emission factor of Regional grid, Southern Grid
Source of data used:	Central Electricity Authority data, www.cea.nic.in
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission Factor is estimated and officially published by Central Electricity Authority, Government of India.
Any comment:	Simple Operating Margin is used, by including Imports

Data / Parameter:	Grid Emission factor *(Build Margin)*
Data unit:	tCO_2/MWh
Description:	Emission factor of Regional grid, Southern Grid
Source of data used:	Central Electricity Authority data, www.cea.nic.in
Value applied:	0.71
Justification of the choice of data or description of measurement methods and procedures actually	Emission Factor is estimated and officially published by Central Electricity Authority, Government of India.

applied :	
Any comment:	Value is calculated based on ex-ante data and the data does not call for reworking every year

Data / Parameter:	Grid Emission factor *(Combined Margin)*
Data unit:	tCO_2/MWh
Description:	Emission factor of Regional grid (Southern Grid)
Source of data used:	Central Electricity Authority data, www.cea.nic.in
Value applied:	0.85
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission Factor is estimated and officially published by Central Electricity Authority, Government of India.
Any comment:	Value is calculated based on ex-ante data and the data does not call for reworking every year

B.6.3 Ex-ante calculation of emission reductions:

In the proposed power plant, biomass is fired and GHG emissions from biomass combustion is not estimated since biomass is considered to be CO_2 neutral. The emissions resulting from biomass transportation are negligible as distance between the power plant and biomass resources is not very far. Hence there are no emissions from the project activity.

B.6.4 Summary of the ex-ante estimation of emission reductions:

N/A

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	Quantity of biomass used in power plant per annum
Data unit:	Tonnes per Annum
Description:	Amount of Biomass used in the power plant
Source of data to be used:	Project Proponent
Value of data applied for the purpose of calculating expected emission reductions	1020

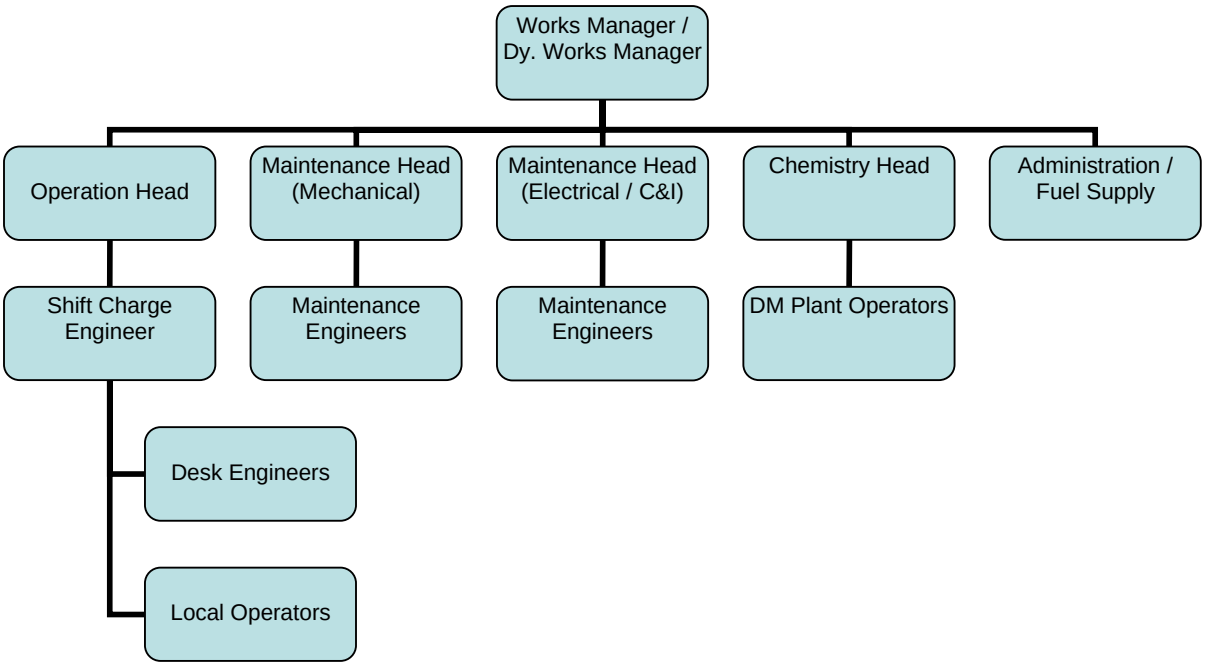
in section B.6	
Description of measurement methods and procedures to be applied:	Directly measured and continuously recording the amount of biomass fed into the power plant and recorded in Log books. The data will be cross checked with the biomass procurement data
QA/QC procedures to be applied:	QA/QC procedures for this are planned. These data will be directly used for calculation of emission reductions.
Any comment:	-

Data / Parameter:	Total power generated and supplied to the grid
Data unit:	GWh
Description:	Electricity supplied to the grid is continuously metered both in power plant as well as Tamil Nadu electricity board sub station.
Source of data to be used:	The data is projected based on the operations of the power plant per annum.
Value of data applied for the purpose of calculating expected emission reductions in section B.6	62.44
Description of measurement methods and procedures to be applied:	Directly measured by electronics meter and recorded in Log books. The data will be cross checked with the production data
QA/QC procedures to be applied:	QA/QC procedures for this are planned. These data will be directly used for calculation of emission reductions.
Any comment:	-

B.7.2 Description of the monitoring plan:

The monitoring methodology applied for this project activity is "Grid connected renewable electricity generation", AMS – I D, Version 10

Since the project is a grid connected renewable energy project, emission reduction quantity depends on the units of energy generated from biomass based power plant and exported to the grid (in kWh) and the baseline emission of the state grid. The methodology covers the monitoring of units exported and the other parameters affecting the quantity of power export and CO2 emissions thereof. The net emission reductions will result from the units of power supplied to the grid.
The Shift operators will collect the required data and will be reported to the Supervisor and all the data will be entered the relevant log book. The pictorial representation of monitoring flow is given in the below figure.



B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Baseline emission calculations are determined by Asia Carbon Emission Management Pvt. Ltd. in consultation with the project proponent and duly completed on 20th November 2006 taking all relevant information and data from Central Electricity Authority published report.

Project monitoring methodology was determined by the project promoter and Asia Carbon Emission Management Pvt. Ltd

Contact information is given below.

Organization	TCP Limited
Street / Post Box	No. 4, Karpagambal Nagar,
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Country	India
Telephone	+91- 44 – 24992435
Fax	+91- 44 – 24991554
E.mail	**tcppower@eth.net**
URL	

Organization	Asia Carbon Emission Management India Pvt. Ltd.
Street / Post Box	#167 Kodambakkam High Road
Building	
City	Chennai
State / Region	Tamil Nadu
Postcode / Zip	600 034
Country	India
Telephone	+91 – 44 – 3918 0501 (4 Lines)
Fax	+91 - 44 – 3918 0501
E.mail	cdmpdd@asiacarbon.com
URL	www.asiacarbon.com

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

Phase I : March 2007
Phase II : April 2008

C.1.2. Expected operational lifetime of the project activity:

25 Years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

Yes

C.2.1.1. Starting date of the first crediting period:

From the date of registration

C.2.1.2. Length of the first crediting period:

7 Years

C.2.2. Fixed crediting period:

N. A

C.2.2.1. Starting date:

N. A

C.2.2.2. Length:

N. A

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Project is eco friendly and renewable biomass is used as a fuel for generating electricity. The pollutants generated from the biomass power plant are as follows,

- Dust and Particulate matter in the flue gas
- Fly ash from the hoppers
- Furnace bottom ash
- Effluent from water treatment plant
- Boiler blow down
- Sewage from the plant

Control Measures for Air Pollution

The dust concentration level in the chimney will be periodically monitored. Corrective steps will be taken if the concentration is not within the acceptable limits, stipulated by the pollution control board. Sulphur di oxide and Nitrogen di oxides are not generated since biomass is used as a fuel. The fly ash and bottom ash from the bottom of furnace air heater hoppers and ESP hoppers is collected in the silo and the ash will be used as manure by the local farmers and road building industry.

Control Measures for Water Pollution

Wastewater from the plant will be properly treated and sent out for disposal. Wastewater from the different parts of plant will be sent to Effluent treatment plant for proper treatment and disposed after treatment.

Control Measures for Noise Pollution

The major source of noise pollution in biomass power plant is from Rotating Equipments, Feed Pumps, Boiler and Superheater safety valves, steam turbine and DG sets. The rotating equipments will be designed properly to achieve minimum noise level. The safety valve outlets, DG sets will be provided with silencers to reduce the noise level to the acceptable limits. The power house building will be constructed with sound proof walls to keep noise level within the acceptable limits.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

N. A

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The stakeholders identified for the project are the following:

- Local Representative (Panchayat President)
- Tamil Nadu Electricity Board
- Contract Labours & Civil Workers
- Local people

Implementation of the proposed biomass power project will have no negative impacts. However a stakeholder meeting was arranged on 8th November 2006 to inform the local community about the proposed project and explain about the economical benefits on its implementation and to address their views if any.

TCP Limited representatives explained about their proposed project and their benefits about the project. Biomass traders and farmers in that local area are beneficial due to the proposed project activity. A separate questionnaire was circulated to the stakeholders during the meeting and the respective comments are summarized and attached in Annexure 5.

E.2. Summary of the comments received:

A brief introduction about the project was given by the project proponent and after that the chair person, interacted with the stakeholders regarding their doubts and concerns of their proposed project activity. The comments can be summarized as positive and environmental friendliness due to the reduction of fossil fuel in power production and Socio economic benefits from the project activity is also appreciated.

E.3. Report on how due account was taken of any comments received:

No negative comments due to the project activity

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	TCP Limited
Street/P.O.Box:	No.4, Karpagambal Nagar
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URL:	
Represented by:	
Title:	Deputy Works Manager
Salutation:	Mr.
Last Name:	T
Middle Name:	
First Name:	Chandramoulee
Department:	Power Division
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Personal E-Mail:	tcppower@eth.net

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

CALCULATION OF SOUTHERN ELECTRICITY GRID EMISSION FACTOR

As prescribed in the methodology the emission reductions will be the amount of electricity supplied to the grid multiplied with the grid emission co-efficient. The energy fed in to the grid will be used to calculate the emission reductions and is measured in terms of kWh.

Estimation of the emission reductions from the project activity = amount of electricity supplied to the grid multiplied with the grid emission co-efficient.

The Grid Emission co-efficient is calculated based on combined margin of the southern grid and is calculated as given below

$E\ Coeff_{grid} = w_{OM} * EF\_OM_y + w_{BM} * EF\_BM_y$

Where

EF_OM_y = emission factor of Operating Margin

EF_BM_y = emission factor of Build Margin

w_{OM} = weight factors of Operating Margin

w_{BM} = weight factors of Build Margin

with respective weight factors w_{OM} and w_{BM} (where $w_{OM} + w_{BM} = 1$), and by default, are weighted equally ($w_{OM} = w_{BM} = 0.5$).

EF_OM_y = emission factor of Operating Margin calculated based on the Grid Dispatch Data Analysis

Calculation of Grid Dispatch Data is given as follows

$$EF\_OMy = \frac{EOM,y}{EGy}$$

$E\ OM,y = \sum EG_h * EF_{DD.h}$

where

EGh = generation of the project (in MWh) in each hour h

$EF_{DD,h}$= hourly generation weighted average emissions per electricity unit (tCO2 /MWh) of the set of power plants (n) in the top 10% of grid system dispatch order during hour h

$$EF_{DD,h} = \frac{\sum F_{i,n,h} * COEF_{i,n}}{\sum_{n} GEN_{n,h}}$$

F i ,j, y = amount of fuel i (in a mass or volume unit) consumed, by relevant power sources j, in year(s) y, j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports to the grid

COEF i, j y = CO2 emission coefficient of fuel i (tCO2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y

GEN j, y = electricity (MWh) delivered to the grid by source j.

Build Margin emission factor (EF_{BM})

The Build Margin emission factor *EF_BMy* is given as the generation-weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most 20% of the generating units built (summation is over such plants specified by *k*):

$$EF\_BM_y = \frac{\sum_i F_{i,y} * COEF_i}{\sum_k GEN_{k,y}}$$

The generation figures are as per the latest 2004 -2005 generation data published by Central Electricity Authority, Govt of India.[4]

[4] http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Annex 4

MONITORING INFORMATION

Please refer to Section B.7.2

Annex 5

Information Regarding Stakeholder Consultation

TCP Limited, Kovillur - Stakeholders Comments									
S.No.	Participants Name	Category	Employment opportunities increased?	Whether land values are increased?	Infrastructure facilities are developed?	Whether you have learnt or exposed to new technology?	Whether you are facing any type of pollution (Air / Water / Sound) problems due to the project?	Whether the electricity facilities are improved?	Whether your local area is improved?
1	M. Krishnanpillai	Civil Engineer	YBVV	Y	YNVV	Y	N	E	YVVMM
2	R. Shanmugam	Local Public	YBVV	Y	YNVV	Y	N	E	YVVMM
3	A. Perumal	Civil worker	YBVV	Y	YNVV	Y	N	E	YVVMM
4	A. Periyaiah	Civil worker	YBVV	Y	YNMM	Y	N	E	YVVMM
5	P. Raja	Civil storekeeper	YBVV	Y	YNVV	Y	N	E	YVVMM
6	S. Karuppaiah	Civil supervisor	YBVV	Y	YNVV	Y	N	E	YVVMV
7	C. Palani	Worker	YBVV	Y	YNMM	Y	N	E	YVVMM
8	P. Durai	Labour	YBVV	Y	YNMM	Y	N	E	YVVMM
9	V. Ravi	Civil worker	YBVV	Y	YNMM	Y	N	E	YVVMM
10	S. Mariyappan	Civil worker	YBVV	Y	YNMM	Y	N	E	YVVMM
11	P. Nagalingam	Civil worker	YBVV	Y	YNVV	Y	N	E	YVVMM

12	G. Selvaraj	Civil worker	YBVV	Y	YVVV	Y	N	E	YVVMM
13	A. Tamilarasi	Civil worker	YBVV	Y	YNVV	Y	N	E	YVVMM
14	M. Eswari	Civil worker	YBVV	Y	YNVV	Y	N	E	YVVMM
15	K. Jaya	Civil worker	YBVV	Y	YNVV	Y	N	E	YVVMM
16	R. Balasubramanian	Contractor	YBVV	Y	YNVV	Y	N	E	YVVMM
17	R. Subramanian	Local Public	YBVV	Y	YNVV	Y	N	E	YVVMM
18	M. Chinnasamy	Labour contractor	YBVV	Y	YNMM	Y	N	E	YVVMM
19	C. Srinivasan	Local Public	YBVV	Y	YNVV	Y	N	E	YVVMM
20	C. Murugesan	Labour contractor	YBVV	Y	YNVV	Y	N	E	YVVMM
21	S. Gajendran	Civil Labour Contractor	YBVV	Y	YNVV	Y	N	E	YVVMM
22	V. Kaleeswaran	Local Public	YBVV	Y	YNVV	Y	N	E	YVVMM
23	C. Ulaganathan	Local Public	YBVV	Y	YNVV	Y	N	E	YVVMM
24	F. Susainathan	Mechanical worker	YBVV	Y	YNVV	Y	N	E	YVVMM
25	S. Ramesh	Mechanical operator	YBVV	Y	YNVV	Y	N	E	YVVMM
26	K. Adinampillai	Security	YBVV	Y	YNVV	Y	N	E	YVVMM
27	K. Mookiah	Driver	YBVV	Y	YNVV	Y	N	E	YVVMM

Y - YES
N - No
B - Both Skilled & Unskilled labours
E - Expected
V - Visible
M - Marginal

Photographs Taken During Stakeholders Meeting on November 8th 2006