

**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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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.

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

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Title: 10 MW Biomass based power Plant at Pollachi, Coimbatore district, Tamil Nadu

Version no: 03

Date: 18/01/2012

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

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Orient Green Power Company Limited (OGPL) is implementing biomass based power project at Kariyanchettipalayam Village, Anaimalai Block, Pollachi Taluk, Coimbatore District, Tamil Nadu, India with an plant capacity of 10 MW. The biomass based power plant will generate electricity by utilizing surplus biomass like coconut residues, Prosopis juliflora, saw dust, wood chips & sugarcane trash and other residues like gram stalks, ginger stalks, tapioca stalks, cotton and chilly stalks and other biomass residues available in surplus in the area and the unit co fires the fossil fuel (Coal). Also the fuel mix composition for power generation may vary based on the availability of the biomass fuels within the project region during the crediting period of the project activity. The use of coal cannot be exceeded beyond 15% in accordance with the statutory approvals received for the Project activity on annual fuel consumption, hence, the project activity can use coal during the crediting period. The plant and machinery of the project consists of a boiler, a steam turbine generator set, power evacuation system and fuel handling system along with their auxiliaries.

The project activity connected to the State Electricity Board, which forms a part of the Southern regional grid of India. Proposed project exports of about 63,072 MWh annually. Thus, apart from aiding in achievement of self sufficiency in power, the generated power will reduce the carbon intensity of the grid. Hence, the project activity by substituting fossil fuel generated power with renewable power, would contribute towards both climate change mitigation and socioeconomic development. The expected emission reductions from the project activity will be 46,983 tCO₂e per annum on an average over the first crediting period of 7 years. The technology applied is deemed current good practice in the region and is not expected to be replaced within the crediting period.

The project activity supports the sustainable development criteria of the host country. The various aspects of the proposed project under each sustainable development indicator as required by the host country

Social well being:

- The proposed project generates employment opportunities for local people during the construction and operation stages.

- The activity of procurement of fuel will provide direct and indirect employment to the local populace.

-The project activity will indirectly contribute to the creation of local infrastructure facilities.

Economic well being:

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- The proposed project will directly benefit the local region by creating new jobs and investment opportunities, stimulating economic development.
 - The project acts as a nucleus for other economic activities such as setting up of cottage industries, shops, hotels etc around the area contributing to the economic development around the project area.

Environmental wellbeing

- The proposed project will have a positive impact on the environment as it will reduce power production based on fossil fuels and lead to an increased sustainability in the power generation sector.
- The proposed project contributes to the reduction of green house gas (GHG) emissions and thus supports environmental well being.

Technological well being:

By utilizing biomass residues as fuel, the traveling grate boiler generates steam, which drives condensing steam turbine to generate power. The exhaust flue gases would be passed through the electrostatic precipitator (ESP) to remove suspended particulate matter (SPM) before sending out to the atmosphere. The project activity represents environmentally safe and sound technology for the application

Hence the proposed project will promote the development of rural economy, thereby promote the harmonious development of society as a whole.

A.3. Project participants:

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Name of the party involved(*) (host) indicates a host party)	Private and/or public entity (ies) project participants(*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	Private Entity: Orient Green Power Company Limited	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

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

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

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A.4.1.1. <u>Host Party(ies):</u>
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India

A.4.1.2. <u>Region/State/Province etc.:</u>

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State: Tamil Nadu

A.4.1.3. <u>City/Town/Community etc:</u>
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District : Coimbatore
Taluk : Pollachi
Village : Kariyanchettipalayam Village, Anaimalai Block

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

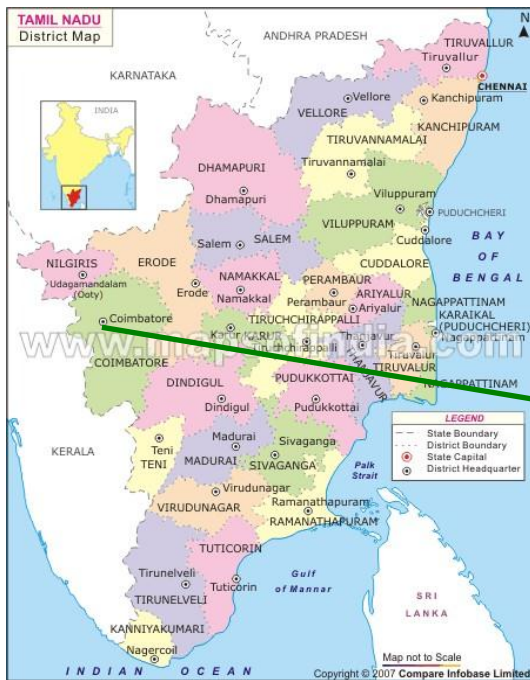
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The project activity is located in the State of Tamilandu, India. The physical location of the project is at S.F No. 94/1,2,3,97/1,2A 1 to 2 A 5, 2C , 98/1to 3 and 99/1 of Kariyanchettipalayam Village, Anaimalai Block , Pollachi taluk in Coimbatore district. The location co-ordinates¹ of the project activity are given below:
• Latitude – 10° 34'16.96" N (=10.571 N) • Longitude – 77° 00'28.73 "E(=77.007 E)

Geographical location of the project is shown in depicted as below:

1

[http://wikimapia.org/#lat=10.5713534&lon=77.0078087&z=14&l=0&m=m&search=10%C2%B034'16.96"N%2C%2077%C2%B000'27.83"E%20](http://wikimapia.org/#lat=10.5713534&lon=77.0078087&z=14&l=0&m=m&search=10%C2%B034'16.96)

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1. Location of Coimbatore District in Tamil Nadu State in India



2. Location of 10 MW Biomass power project in Coimbatore District.

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

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According to the Appendix B to the simplified modalities and procedures for small-scale CDM project activities, the proposed project activity falls under the following type and category.

- Sectoral Scope :** 1, 'Energy industries (renewable - / non-renewable sources)'
- Type :** **I-RENEWABLE ENERGY PROJECTS**
- Category :** **I.D. Grid connected renewable electricity generation;**
- Reference :** [AMS-I.D. Version 16](#), EB 54

The project activity involves the installation of a new biomass based power plant to generate electricity that would be supplied to various consumers connected to the grid. In the baseline scenario the same quantity of energy would have been generated in the southern grid which is dominated by fossil-fuel based power plants and would lead to emission of green house gases. The capacity of the power unit does not exceed the limit of 15 MW.

The green field power project involves installation of a 52 TPH capacity travelling grate multi fuel fired.boiler (66 kg/cm²(g) & 465+/- 5 °C) and one 10 MW impulse type turbine to generate steam and drive a generator for generation of electricity, power evacuation system and fuel handling systems.

The project is installing traveling grate based boiler that fires mainly or solely renewable biomass residues (Some fossil fuel may be co fired). The project activity envisages the use of fuel mix of renewable biomass and coal 1(85:15) to be combusted in the project activity.

The technology used in the project is available in India and no transfer of technology is envisaged. Proposed project is expected to export of 63,072 MWh per annum at a plant load factor (PLF) of about 80%. The electricity output will be stepped up to suitable voltage level for interconnection with the grid. The other accessories include auxiliary installations and systems, including pressure parts ,Electrostatic precipitator (ESP), cooling water system, ash handling system, feed water system, raw water system and DM plant etc.,

Table A.1: Key technical specifications of major equipments of candidate project

Boiler	
No. of boilers	One number
Type	Travelling grate
Boiler capacity / Steam Flow rate	52 TPH
Steam pressure at super heater outlet	66 kg/cm ² (g)
Steam temperature at super heater outlet	465 ± 5 °C

Turbo Generator set	
Type of turbine	Impulse type
Quantity	1
Power	10000 kW
Inlet Steam pressure	63 kg/cm ² (g)
Steam temperature at the TG inlet	460 Deg C
Steam condensing system	Air-cooled type
Type of generator	Air cooled, brush less exciter
Quantity	1
Out put	12500 kVA
Power factor(pf)	0.8
Power (kVA × pf)	10000 kW /10 MW
Voltage	11000 V
Frequency	50 Hz
Speed	1500 min ⁻¹

Power Evacuation	
Sub station	
- grid Interfacing voltage level	11 kV
- Location	Angalakurchi- 110 kV Sub-station
- Distance	~5 km from the project location

Energy details (in MWh/y)	
Gross energy generation	70,080
Auxiliary consumption (@10 % on gross energy)	7,008
Energy available for export after auxiliary consumption	63,072

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The metering equipments will be located at the grid interface point, and the electricity delivered to the grid / from grid will be monitored as the applied methodology required.

The expected operational lifetime of the project is 25 years² and a renewable crediting period of 21 years has been chosen .

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

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Estimated emission reductions from the project activity over the first crediting period are tabularized below

Years	Estimation of annual emission reductions in tonnes of CO ₂ e
*2011	46,983
2012	46,983
2013	46,983
2014	46,983
2015	46,983
2016	46,983
2017	46,983
Total estimated reductions (tonnes of CO₂e)	328,881
Total number of crediting years	7
Annual average of the estimated reductions over the crediting period (tonnes of CO₂e)	46,983

*In the table year 2011 corresponds to 20/10/2011 to 19/09/2012 or from the date of registration

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

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No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

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

The Project participants confirm that there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity with the same project participants and whose project boundary is within 1 km of the Project boundary of the proposed small-scale activity at the closest point.

According to *Appendix C of the Simplified Modalities and Procedures for Small-scale CDM project activities*, the Project is not a debundled component of a large scale project activity.

² Default values for Technical lifetime prescribed for Boilers, steam turbines, electric generator - air-cooled and transformers in Annex 15 of EB 50

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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:

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 Title: *Grid connected renewable electricity generation*,

Reference: Approved Small Scale methodology AMS-I.D. Version 16, EB 54.

Methodological Tools³:

- “Tool to calculate the emission factor for an electricity system” (Version 02), EB 50, Annex 14.
- “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” (Version 02) EB 41, Annex 11.
- General guidance on leakage in biomass project activities, (Version 03) EB 47, Annex 28.

For additional info on tools available vide web link

<http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>
B.2 Justification of the choice of the project category:

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The project is new installation of electricity generation unit to displace the energy consumption in the electricity grid system. The project activity involves a system with a generation potential of 10 MW. Since, the plant capacity is less than the 15 MW, the project activity meets with the criteria of Type I.

Type I: Renewable energy project activities with a maximum output capacity equivalent to up to 15 MW (or an appropriate equivalent); specified in decision 17/CP.7 of the simplified modalities and procedures.

The project satisfies the criteria set out for use of the SSC M&P with respect of Type I generation less than 15 MW. Approved simplified baseline and monitoring methodologies AMS-I.D. ‘Grid connected renewable electricity generation’ Version 16.

The project activity meets all applicability criteria (Furnished in Annex 3 of this report) as described in methodology AMS-I.D. Version 16, EB 54 and therefore confirms that the selected methodology is applicable to the project activity is thus justified.

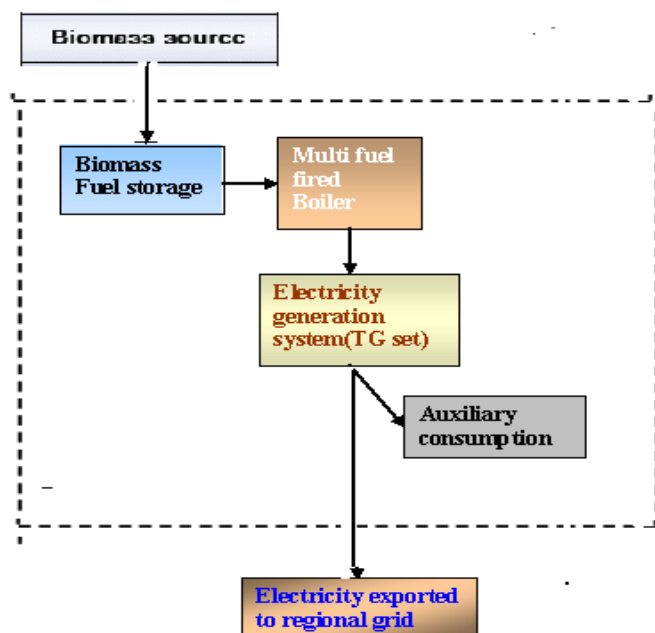
B.3. Description of the project boundary:

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In accordance with item 9 of methodology AMS-I.D. Version 16,” the physical, geographical site of the renewable generation source delineates the project boundary “

The project’s system boundary includes the fuel supply point, storage and processing, boiler, steam Turbo-generator set and all other power generating equipment and auxiliary consumption units. The spatial boundary of the project includes the southern regional grid of India to the electricity system that the proposed project is connected to.

³ <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved>



B.4. Description of baseline and its development:

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Baseline for electricity:

The project activity is the installation of a new grid-connected renewable electricity generation plant/unit and the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

Hence, in accordance with the approved methodology AMS-I.D.Version 16, the baseline is as per item 11 of the methodology as the baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor (measured in tCO_2e/MWh).

The grid emission factor or CO_2 emission factor of the grid is calculated in a transparent and conservative manner as per options in 12(a) or 12 (b) item of AMS-I.D.Version 16.

Option 12 (a) has been chosen for the project activity and a Combined Margin (CM) accordingly to the “**Tool to calculate the emission factor for an electricity system**”. In India, the Central Electricity Authority (CEA) developed an official database of all grid-connected power stations for the purpose of establishing a consistent quantification of the CO_2 emission baseline. The version of [CO₂ Emission Database Version 5.0, November 2009](#) available has been used for the project activity, grid emission factor of the southern region, calculated as a combined margin consisting of combination of operating margin and build margin.

Parameter	Data Source
Baseline Emissions in the year y; $tCO_2(BE_y)$	Estimated in accordance with the applied methodology

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Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh) ($EB_{BL,y}$)	From Plant Log sheets and JMR (Joint Meter Reading certificates) Records
CO ₂ Emission Factor in year y ; tCO ₂ /MWh ($EF_{CO_2,grid,y} (=EF_{grid,CM,y})$)	CO ₂ Baseline Database (Version 05, Nov 2009)
Operating margin emission factor $EF_{grid,OM,y}$ (tCO ₂ e/MWh)	CO ₂ Baseline Database (Version 05 Nov 2009) by CEA
Build margin emission factor $EF_{grid,BM,y}$ (tCO ₂ e/MWh)	CO ₂ Baseline Database (Version 05, Nov 2009) by CEA

For grid emission factor calculation and detailed data sources, please refer to Sec B.6.1 of this documentation.

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:

Prior Consideration of CDM.

The start date of the project activity is 28/05/2009 which is the date of Letter of Intent for EPC contract. Taking in to account this as start date, as per the guidelines on the demonstration and assessment of prior consideration of the CDM, Version 04, Annex 13 EB 62 project activities with a starting date on or after 02 August 2008, the project participant must inform Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status.

As the start date was after 02 August 2008, the project activity falls under “new project activity “ and the proponent communicated the Secretariat of the UNFCCC as per the F-CDM_form designed for compliance and DNA on 21/11/2009 its intention to develop and register the project as a CDM activity with in the six months period from start date. It was listed in CDM website vide web source: <http://cdm.unfccc.int/Projects/PriorCDM/notifications/index.html>

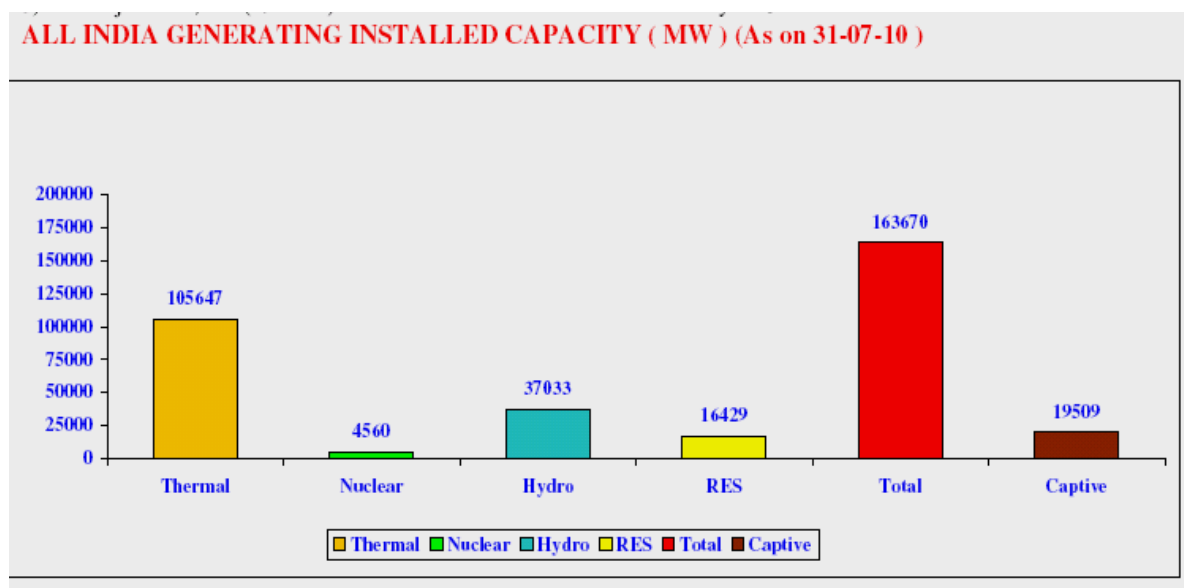
- Detailed Project Report : 02/05/2009
- Board Resolution for CDM consideration : 18/05/2009
- LOI with EPC : 28/05/2009
- LOI for Civil Construction works : 28/05/2009
- Appointment of CDM Consultant : 01/06/2009
- Intimation to Indian DNA & UNFCCC : 21/11/2009
- Acknowledgement Mail for Prior consideration : 06/01/2010
- Consent to Establish from TNPCB : 29/04/2010
- Energy Purchase Agreement (EPA) with TNEB : 10/05/2010
- Stake Holders Meeting : 10/07/2010
- Appointment of DOE : 18/08/2010
- PDD web hosted for GSC : 11/11/2010
- Validation Site visit : 28/12/2010
- HCA approval from Host country DNA : 14/03/2011
- Consent to Operate from TNPCB : 09/05/2011
- Plant Synchronized with grid : 04/07/2011

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It can be observed from the above that the project activity conforms to the requirements vide item 2 of Annex 13 of EB 62. The relevant documents were submitted to DOE as a part of validation.

National Policies and circumstances

The Indian power sector presents the following picture as on July 2010⁴, where there is a heavy reliance on thermal energy.



The contribution of renewable energy sources that comprise of wind, small hydro, biomass power & biogas, urban & industrial waste water and solar are approximately 10.03 %. The Ministry of Power, Government of India has an ambitious plan of providing power for all by 2012. At the end of the tenth plan (2002-2007), the total installed capacity of the thermal sources of power (coal, diesel and gas) was 86,014.84 MW⁵. In the eleventh plan, as of July 31, 2010, the share of the thermal sources has risen to 10,564 MW. The Government has planned to add approximately 78,700 MW⁶ power in the eleventh plan, out of which the thermal sources would account for 59,693 MW. Clearly, the trend indicates the allotment and provision for thermal energy sources given the demand for power and sustenance of the growth rate at around 7- 8%. While the Government encourages renewable energy based power generation, there is no mandate to curb the use of fossil fuel based thermal energy plants for supplying the growing need for energy.

According to the *Non-binding best practice examples to demonstrate additionality for SSC project Activities (Annex 34 EB 35)* list various barriers, such as investment barrier, access-to-finance barrier, technological barrier, barrier due to prevailing practice and other barriers, out of which, at

⁴ http://www.cea.nic.in/power_sec_reports/executive_summary/2010_07/8.pdf

⁵ http://www.cea.nic.in/power_sec_reports/Executive_Summary/2007_03/8.pdf

⁶ http://www.cea.nic.in/power_sec_reports/Executive_Summary/2010_03/4.pdf

least one barrier shall be identified due to which the project would not have occurred any way. The main barrier identified by the Project participants for the proposed Project is investment barrier.

Investment barrier

The PP uses the investment analysis to demonstrate the additionality. It is proved that the financial returns of the proposed project are insufficient to justify the investment. The project has both the Debt and Equity component for project cost; hence the PP has selected Project Internal Rate of Return (IRR) as a suitable financial indicator. IRR refers to the rate of return that the project is expected to generate based on the projected cash flows accruing over its expected lifespan. The investment analysis was completed for the proposed project by using benchmark analysis in the PDD. The post tax internal rate of return (IRR) has been calculated by estimating the project cash flows, which has been compared with the Benchmark .

Appropriateness of choosing benchmark:

As per the GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS “ Version 05 by CDM EB at its 62nd meeting “In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR” (Annex 5, page No.3, item 12 Selection and Validation of Appropriate Benchmarks - EB 62), benchmark should be based on parameters that are standard in the market. Based on this the PP has taken into account the Weighted Average Cost of capital as the Benchmark Return.

WACC is considered to be an appropriate benchmark for post tax project IRR. The selection of the WACC as a benchmark for the proposed project activity is appropriate in view of the fact that the total finances obtained for the project include two components viz.: loan and equity. In order to evaluate the financial viability of the project, it is required to assess the expected minimum returns on debt as well as equity components of the total investment. Hence, the benchmark selected needs to consider the risks associated with each of the components of the total investment. Thus, from this perspective, WACC is one of the most appropriate benchmark for comparing project IRR since it is the weighted average of the total cost of different components of the investment .

So for this project activity, the project IRR post tax is compared with the Weighted Average Cost of capital (WACC) to demonstrate the additionality of the project.

$$WACC = [E / (D+E) * CE] + [D / (D+E) * CD * (1-T)]$$

Where

$$CE = R_f + (R_m - R_f) * \beta$$

<i>Parameter</i>	<i>Units</i>	<i>Description</i>
D- Debt component of total investment	Currency	Value as per Detailed Project report.
E- Equity component of total investment	Currency	Value as per Detailed Project report.
CE-Cost of Equity	%	The Capital Asset Pricing Model (CAPM) approach having a clear theoretical foundation is a widely used methodology for

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		determining the cost of equity. It asserts that the required rate of return on a risky asset is a function of the risk free rate of return (R_f) plus a risk premium that reflects the return on a well-diversified portfolio of risky assets over the risk free rate ($R_m - R_f$), scaled by the “beta” of the risky asset which is a measure of the systematic risk of the risky asset relative to the market risk . Calculated as per formula above
CD-Cost of Debit	%	Cost of debt is defined as the rate at which lender’s agree to lend money to a project. The ‘Guidance on the Assessment of Investment Analysis’ clarifies that, ‘ <i>In the cases of projects which could be developed by an entity other than the project participant, the benchmark should be based on parameters that are standard in the market is suitable in the context of he project activity.</i> Accordingly, the Prime Lending Rate (PLR) quoted by the RBI at the time of decision making ie 12.25% ⁷ is identified as the appropriate yardstick. As interest on loan is tax deductible, in order to arrive at the post tax cost of debt, the cost of debt is multiplied with the factor (1-applicable marginal tax rate) is used for computation of cost of debt while calculating applicable WACC for the project activity,
T- tax rate	%	The applicable tax rate pertaining to date of decision making on the project activity in the host country of the CDM project. The rate applicable ⁸ is 16.995% ⁹ .
R_f –Risk free Return	%	The risk free return is understood as the rate of return on an asset that is theoretically free of any risk, therefore, the rate of interest on government securities is considered as risk free rate. The date of CDM consideration of the proposed project activity is 18/05/2009. At the time the data available for the weighted average yield of Government of India Securities was that of the year 2008-09, which was 7.69% ¹⁰ .

⁷ <http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/4Tab120609.pdf>

⁸In accordance with the Guidelines on Assessment on Investment Analysis version 05, as the project activity can be developed by any entity other than the project participant, the tax rate used for computation of benchmark should also be applicable to any investor investing in power sector projects in India. Tax holiday that is applicable to the power sector projects (developed as Independent Power Producers) is ten years from the first fifteen years and there by power sector projects do not have to pay normal tax rate as a result of tax holiday and have to pay only the applicable Minimum Alternate Tax.Hence a Minimum Alternative Tax rate is applicable as per the provision of taxation rules.

Projects being developed as independent power producer (IPP), for additionality one consider the returns from the project activity as an independent project activity, even though the project is developed a business group. The project activity is eligible for Tax holiday under the rules of Income Tax Act, Hence for IRR analysis, MAT rate of 16.995% as prevailing at the time of decision making for the project activity is used in the calculations of the WACC.

⁹ <http://taxguru.in/budget-2010/minimum-alternate-tax-%E2%80%93-enhancement-budget-2010.html>

¹⁰ source: Table – 7.2 , Reserve Bank of India Annual Report .web-link:
<http://rbidocs.rbi.org.in/rdocs/AnnualReport/PDFs/11PDM080809.pdf>

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R_m -Expected market returns	%	BSE sensx has been used as a proxy for market return as of its diversified portfolio . Market return or Compound Annual Growth Rate (CAGR) is calculated for the period from 01/04/1979 to 30/04/2009 (for a period of 30 years prior to investment decision for the project activity). The data for the same has been sourced and Bombay Stock Exchange . The value works out to be 17.04% ¹¹ .
$(R_m - R_f)$ Market risk premium;	%	The market risk premium is the return that an investor expects over and above the risk free return available in the market. The market risk premium has been estimated from the inception of the well diversified BSE sensx index till the project investment decision using historical approach. This can be defined as the historical differential return of the market and the risk-free rate. The most common method of calculating this is the difference between historical return of the stock market index and the risk free rate. The differential can be calculated as arithmetic or geometric average. The geometric average ⁷ usually is a more accurate representation of the risk premium; accordingly the market risk premium has been calculated as the historical geometric mean return on the stocks (using the BSE sensx index) minus the return on government securities. This would give the incremental returns over and above the risk free rate. The same comes to be 9.35% as calculated based on the above .
β	Value	The β in the CAPM equation helps to account for the systematic risk by quantifying the sensitivity of the stocks of the companies representing a particular project type/sector with the market returns. Thus, it incorporates the risk of a specific sector in the calculation of the cost of equity. The project activity type is biomass based power generation therefore the approach should be based on the beta values of listed biomass based power generation companies in India. Therefore, in the absence of sufficient adequate data on companies that are exclusively into the exactly same type of business (i.e. biomass power projects), the next best option for assessing the risk of such type of projects is to consider the data available on companies that are involved in similar businesses. As the Project activity belongs to power generation, listed power generation companies ¹² whose market data was available at the time of investment decision was considered to evaluate beta. The sample companies represent the power generation as sourced from the capitaline data base ¹³ for a period of one year ¹⁴ . The beta value of companies in the power sector

¹¹ <http://www.bseindia.com/about/abindices/bse30.asp>

¹² Pertinent data has been taken from Annual Reports for each company

¹³ The relevant webshots/snapshots are shown in the excel spread sheets furnished to DOE .

¹⁴ The time period of one year considered for beta value calculation is justified as per Credit Rating Information Services of India limited (CRISIL) report to CERC. For economies, and for companies whose

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		<p>listed in the Bombay Stock Exchange for the period 30/04/2008 to 30/04/2009 as at the time of investment decision(18/05/2009) of 1.3446 has been applied for the calculation of cost of equity of the project activity. The beta of these companies was computed by regressing the stock return on BSE sensex index. As these beta values are levered and reflects the business risk associated with these companies due to different debt equity ratio and tax rate applicable to these companies. The gearing and tax rate of respective companies have been used to unlever the beta. Data relating to market return and stock return of the companies have been sourced from BSE India website¹⁵. To arrive the beta value (representing the project specific risk the same was re-levered using the debt equity ratio and the tax rate, which are standard in the market (conformity to Guidance on investment analysis) so that the expected/required return reflect the risks associated with the project type or activity. The lowest re-levered beta has been chosen to compute the risk premium to reflect the risk of the project type .This works out to 1.3446 and used for the calculation of the cost of equity for the proposed project activity. (Detailed calculations of the beta values are furnished in IRR analysis work sheet)</p>
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Detailed calculations of the benchmark and IRR analysis are enclosed as worksheets.

Based on the above parameters WACC has been calculated

$$\text{WACC} = [30\% * \{7.69\% + 1.3446 * (17.04\% - 7.69\%) \}] + [70\% * 12.25\% * (1 - 16.995\%)]$$

$$= 13.20\%$$

Hence the benchmark for the project activity is calculated as 13.20%

The IRR analysis has been carried out for a period of twenty five years a default figure values for Technical lifetime prescribed for Boilers, steam turbines, electric generator -air-cooled and transformers in Annex 15 of EB 50 and major of the input values are sourced from the detailed project report (DPR), Tariff order by TNERC(27/04/2009)¹⁶, Energy purchase Agreement(EPA) , financial incentives & tax rates applicable etc., The key assumptions considered in arriving the financial indicator are furnished below:

Parameter	Value	Source
Plant Capacity	10 MW	Detailed Project report (DPR). This can be cross verified from approvals/ clearances obtained for the project activity by PP .

capital structure and operating environment has been changing, the time period over which beta is calculated should be small, preferably a year as in case of power sector in India which went significant restructuring after electricity act 2003. This ensures that the risk profile of the company vis-à-vis the market is relatively stable over the term over which beta is being calculated

¹⁵ <http://www.bseindia.com/>

¹⁶ <http://tnerc.tn.nic.in/orders/Tariff%20Order%202009/Bio%20Mass%20Order%2027.04.2009.pdf>

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Plant Load Factor	80 %	DPR and the DPR has been prepared by a reputed third party engineering consultancy engaged by PP , it can be concluded that the Plant Load Factor (PLF) is as per Clause 3 (b) of Annex 11 of EB 48 . In addition, in order to demonstrate that the PLF of the project is reasonable and credible, the applied value for plant load factor complies with that as stipulated in the tariff order by TNERC ¹⁷ on 27 Apr 2009 for procurement of power from biomass based power projects. Hence, the PLF assumed is conservative, particularly having regard to the fact that the financial analysis assumes 365 days of working.
Gross Energy generation	70.080 GWh	Ex-ante estimate calculated on the basis of parameters stated above
Auxiliary Consumption	7.08 GWh	Auxiliary consumption@ 10 % has been considered from the Detailed Project Report ¹⁸ . It may be mentioned that the auxiliary consumption is in conformity with the TNERC tariff order 27 Apr 2009. Hence the assumed value was considered appropriate for the size and type of the plant.
Energy exportable	63.072 GWh	Based on Ex-ante estimate
Total project cost	INR 487.00 (millions)	Detailed Project Report and the considered cost is in compliance with the Tariff order 27 Apr 2009 (Comparison with per MW cost of biomass based power project as give in the order).Further review of projects adapting similar technology and of similar scale. Hence the considered project cost for financial analysis is appropriate.
Means of Finance (INR.in million) - Debt @ 70 - Equity @ 30	340.90 146.10	Detailed Project Report. The respective proportion of debt and equity has been proportioned as 70:30 in the financing pattern and is as recommended by TNERC in its tariff order dated 27 Apr 2009.
Tariff rate	4.50 INR /kWh	The revenues are calculated on the basis of energy exportable from the project activity, Tariff as per TNERC tariff order for procurement of power from biomass based power project on 27 Apr 2009 as per the executed EPA.
Specific Fuel Consumption	1.17 Kg/kWh	Ex-ante estimate fuel mix based on the availability as in biomass assessment report, calorific values of the fuels.

¹⁷ <http://tnerc.tn.nic.in/orders/Tariff%20Order%202009/Bio%20Mass%20Order%2027.04.2009.pdf>

¹⁸ Further the plant load list provided to DOE in conformity for the considered auxiliary consumption.

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Fuel Requirement (100% PLF)	102,546 Tons	Ex-ante estimate calculated based on the Specific fuel consumption and the energy generation.
Price of biomass fuel	2041 [#] . INR/Ton	The fuel price considered for additionality demonstration is based on detailed project report available at the time of decision making. The fuel prices considered in the DPR are based on quotations received from suppliers. Since the price is based on the quotations obtained from the suppliers at the time of preparation of DPR, which formed the basis for decision making (and therefore conforms to guidance 6 of Annex 5, EB 62), the biomass and fossil fuel price considered are suitable and appropriate for the project activity at the time of decision making. The fuel price of INR 2185 is the weighted average fuel price for the fuel mix of biomass and Coal (85:15)
Price of Coal	3000 INR/Ton	
Avg. Cost of Fuel	2185 INR/Ton	
Annual escalation on fuel price	5 %	
O &M Expenses	3.96 %	Detailed Project Report & the same can be cross checked with the TNERC tariff order dated 27 Apr 2009. Thus the fuel price escalation of 5% considered in the financial analysis is valid and reasonable.
O&M annual escalation	5 %	Considered as per the TNERC tariff order 27 Apr 2009. Hence the considered O&M expense is appropriate and justifiable.
Insurance charges	0.70%	Detailed Project Report & this is in accordance with the TNERC tariff order 27 Apr 2009. Hence, the escalation of 5% considered is acceptable.
Interest on Term Loan	12.5 %	As per TNERC order dated 27 Apr 2009.
Loan Tenure	11 Years	As per the Loan sanction for the project activity
Moratorium	1 Year	
Loan repayment Period / years	10 Years	
Interest on Working capital	14 %	Detailed Project Report.
Tax depreciation - Building - Plant & Machinery	10% 80%	As per Indian Income tax rates. http://taxclubindia.com/simple/depincometax.rtf
Book depreciation - Building - Plant & Machinery	3.34 % 5.28%	Depreciation rates as per Companies Act of India. http://www.fastfacts.co.in/resources/DepCoAct.rtf
Income Tax (Regular)	33.99 %	Tax rates were in accordance with Income tax act. http://ajohnmoris.com/index.php?pg=it_rates
Minimum Alternative tax(MAT)	16.995 %	Tax rates were in accordance with Income tax act. http://taxguru.in/budget-2010/minimum-alternate-tax-%E2%80%93-enhancement-budget-2010.html

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The weighted average cost of biomass fuel works out be INR 2041 per MT as per the envisaged biomass fuel mix. TNERC tariff order dt. 27 Apr 2009 states that culmination of a consultative process spread over eleven months beginning in July 2008. Hence, the biomass price considered in the order represents the price prevailing in 2008. The order also states that some of the stakeholders have demanded fuel price in the range of INR 2400 to INR 2500/ MT with an annual escalation of 5% (page 15)¹⁹. However, TNERC chose to fix the price at INR 2000/MT. As against this, the weighted average biomass price considered is only INR 2041/MT²⁰,

Also the cost increase of biomass fuel is also evident from the independent literature²¹ which confirms that the biomass price has been increasing exorbitantly , the cost has increased to a level of INR.2400 per tonne during the year 2009, which proves that the biomass cost considered for the project activity is appropriate .

In the above background the considered cost does not appears to be as high and is appropriate.

The investment analysis is provided in a spreadsheet with all the relevant references for the input values.

Considering the above mentioned set of input values the post tax IRR from the project has been calculated as 6.61%, which is lower than the selected benchmark of 13.20% , from this result, it may be concluded that the project is financially unattractive.

Sensitivity analysis:

The PP has conducted the sensitivity analysis based on the main factors to affect the result of the IRR analysis that are: Energy generation/PLF, project cost / total investment, Fuel cost, electricity tariff rate, annual O&M cost. The choice of variables and range of variations meet the requirements specified in “Guidance on the Assessment of Investment Analysis”. The parameters were subject to the variation of +/- 10 %.

Factor	Variation IRR -10%	Base case IRR	Variation IRR +10%
Generation	3.43%	6.61%	9.03%
Project Cost	9.28%	6.61%	3.78%
Fuel Cost	13.23%	6.61%	-
Tariff	-	6.61%	8.11%
O&M Cost	7.66%	6.61%	5.30%
Benchmark	13.20%		

¹⁹ Page 15 vide

<http://tnerc.tn.nic.in/orders/Tariff%20Order%202009/Bio%20Mass%20Order%2027.04.2009.pdf>

²⁰

²¹ <http://www.financialexpress.com/news/biomass-power-generation-gets-short-shrift-in-tamil-nadu/417812/0>

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The project IRR does not reach the benchmark value of 13.20 % either by increase of electricity generation or electricity sales tariff by 10% or reduction of the project cost by 10% and it consistently supports the results of the investment analysis.

Further it is also observed that IRR cross benchmark in the following scenarios:

- *Generation increases by 31.00 %*
- *Project cost reduces by 23.69 %*
- *Fuel cost reduces by 9.94 %*
- *Tariff increases by 141.5%*
- *O& M Cost reduces by 92.38 %*

Any of the above scenarios are not expected to happen for the following reasons:

Fuel price: It has been observed the IRR reaches the benchmark when the fuel cost is reduced by 9.94 % It has been inferred from the DPR and quotation from the different suppliers that the price of primary biomass is variable in nature. Biomass prices unlike fossil fuel are not regulated by any agency and unexpected prices hikes are a common phenomenon primarily due to

- Demand is created for the surplus biomass in the region which otherwise remains unutilized. With sustained demand for biomass, the awareness amongst sellers of biomass increases about the dependence of such power plants on the biomass for their operations
- Once the plant gets commissioned, the biomass sellers/ farmers would seek higher prices for the fuel which the project proponent will be forced to pay.
- The transportation cost (including loading and unloading, labor cost and physical characteristics) constitutes a significant portion of the landed .

Further more Review of public news articles²² & TNERC order dated 15/05/2006(INR 1000 per Ton) and TNERC order dated 27/04/2009(INR 2000 per Ton) indicates that the biomass prices have doubled in three years. The IRR remains below the selected benchmark by considering the fuel price recommended by the TNERC in its Tariff order 2009 ie INR 2000 per MT.

Even TNERC in its order has allowed a 5% escalation in biomass year on cumulative basis year after year. Therefore reduction in the fuel price is not a realistic assumption.

Generation vis-à-vis Plant Load Factor: Increase in generation is not likely. As of the energy generation estimates were made by considering the PLF of 80% as per DPR . The sensitivity analysis demonstrates that the project IRR is still below the benchmark of 13.20 % if the annual energy generation of the proposed plant is increased by 10%. A 10% increase in PLF would mean achieving a PLF of almost 88 %, which is not possible in actual practice²³. A positive variation of 31.00 % (ie~104 % PLF) in the generation makes the IRR to reach the bench mark which is not a practical scenario.

Total Investment cost: The cost taken for computation is based on DPR . The capital cost primarily comprises of the cost of plant and machinery, land and buildings. Out of this, the cost of plant and machinery comprises of the about 75 % total project cost. The purchase orders for plant and machinery had already been placed. Since the project has been commissioned recently the envisaged

²² <http://hindu.com/2008/11/26/stories/2008112652561800.htm>

²³ Vide page 12/102 of s Tariff order 2009 by TNERC the actual PLF of the biomass based power plants furnished by the TNEB for 2007-08 varied from 5% to 70%. and that of 2008-09 (till Jan 09) is of 3 % to 48%

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investment has been utilized for the implementation²⁴. Hence a 23.69 % reduction in estimated investment cost gives the benchmark which is deemed unlikely.

O&M Expenses: With a decrease in annual O&M cost by 92.38 % , the Project IRR reaches the benchmark. However, the annual O&M is the sum of salary and welfare of employees, materials fee, maintenance fee and miscellaneous account, and a number of indicators suggesting that O&M expenses are rising as time go by. Therefore, the decrease in the annual O&M cost is not expected.

Tariff: rate : The tariff rate taken in computations is as per EPA executed with the utility , which refers to the TNERC Tariff order 24 Apr 2009 .The tariff rate is not likely to change as electricity utility offers a predetermined tariff rate as determined by the Tamil Nadu Electricity Regulatory Commission (TNERC). Further, the PP has entered in to a Energy Purchase Agreement with the TNEB at an agreed rate, and the EPA for a period of 20 years. Therefore, the tariff rate represents the firm rate, there by the variation has been considered from twenty first year for sensitivity analysis and as such the question of any hike and reduction in the tariff rate is highly unrealistic.

Based on the investment analysis that included an assessment of all parameters and assumptions used in calculating the relevant financial indicator, the financial returns of the proposed CDM project activity would be insufficient to justify the required investment.

The prospective revenues from CDM would positively help the project participant in moving ahead and with this objective; the project participant is keen on registering this project activity with the CDM executive board.

Conclusion: This project is found to be additional since, the project is financially unviable without CDM revenues- this presents a signification investment barrier that is alleviated by CDM support. These have been elaborated in the preceding account. Knowing that CDM support will be available to the project proponent ameliorates the fear of the project proponent about other uncertainties of the project. Thus, the project proponent requires CDM support.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:
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Baseline Emissions

The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission Factor

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

Where:

BE_y	Baseline Emissions in year y , (tCO ₂)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO_2,grid,y}$	CO ₂ emission factor of the grid in year y (t CO ₂ /MWh)

²⁴ C.A certificate for the actual cost incurred is provided to DOE.

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The project activity is power generation project, where in residues are combusted in a boiler to produce steam, which drives a turbine connected to an alternator, producing power. No anthropogenic emissions would occur due to utilization of envisaged fuels as the biomass residues are considered as carbon neutral fuels.

The project activity envisages the use of a fuel mix of renewable biomass and coal to be combusted in the project activity. The use of coal cannot be exceeded beyond 15% in accordance with the statutory approvals received for the Project activity. However the project can fire 100% biomass, but the use of coal cannot exceed beyond 15% on annual basis as fuel mix proportion. Hence, provision is made in the PDD to account for any fossil fuel consumption by the project activity during the crediting period.

For projects consuming biomass and fossil fuel to produce electricity, a specific energy fuel consumption of each type of fuel (biomass or fossil) to be used should be specified ex ante. The consumption of each type of fuel (biomass or fossil) will be monitored.

If fossil fuel is used, the electricity generation metered should be adjusted by deducting the electricity generation from fossil fuels using the specific energy. In accordance to the methodology AMS-I.D. for projects consuming biomass a specific energy consumption of each type of fuel to be used, should be specified ex ante and the consumption of each type of fuel shall be monitored or estimate using energy balance.

Specific Energy Consumption (SEC)

For the above mentioned items in AMS-I.D. Version 16 item 22 - No 6. In both the options, to arrive the Specific Energy Consumption, the Station Heat Rate (SHR) of the biomass power project needs to be determined. The following are the detailed equations proposed to calculate Station heat rate and specific fuel consumptions. The arrived specific energy consumption will be used as fixed ex-ante. However the consumption of each type of biomass / fossil fuels will be monitored.

Station Heat Rate (SHR)

$$SHR_y = H_y / EG_{Gross,y}$$

Where

H_y = Total amount heat energy provided into the system during the year y (TJ)

$EG_{gross,y}$ = Total quantity of electricity generated from the project activity during year y (MWh)

$$H_y = \sum (F_y \times GCV_y)$$

where

F_y = Quantity of each fuel type combusted in the project activity during the year y (Tons)

GCV_y = Gross calorific value of each fuel type combusted in the project during the year y (kcal/kg) or (TJ/ Ton) (if GCV in kcal then Conversion factors can be used to determine in kJ or TJ)

For emission reduction calculations considered as TJ/Ton

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Option 1 (Vide No.6 of AMS-I.D. Version 16 Clause 22):

If fossil fuel is used, the electricity generation metered should be adjusted by deducting the electricity generation from fossil fuels using the specific energy consumption and the quantity of fossil fuel consumed

$$EG_{ay} = EG_{Gross,y} - EG_{FF,y}$$

Where,

EG_{ay} = The electricity generation adjusted @ fossil fuel (coal) using during the year y (MWh/y)

$EG_{Gross,y}$ = The gross energy generation by the project during the year y (MWh/y)

$EG_{FF,y}$ = The net electricity generation from the combustion of fossil fuels (MWh/y)

$$EG_{FF,y} = EG_{FF,Gross,y} - EG_{FF,Aux,y}$$

Where,

$EG_{FF,Gross,y}$ = The gross electricity generation from the combustion of fossil fuels during the year y (MWh/y)

$EG_{FF,Aux,y}$ = The corresponding amount auxiliary electricity consumption for the electricity generated from the combustion of fossil fuels (MWh/y)

$$EG_{FF,Gross,y} = \frac{FF_{i,y} \times GCV_{i,y}}{SEC_{i,y}}$$

Where

$FF_{i,y}$ = Quantity of fossil fuel type i combusted in the project activity during the year y (in Tons)

$SEC_{i,y}$ = Specific energy consumption of the fossil fuel type i combusted in the project activity during the year y (in TJ/MWh)

$GCV_{i,y}$ = Gross calorific value of each fuel type combusted in the project during the year y (TJ/Ton)

$$EG_{FF,Aux,y} = EG_{FF,Gross,y} \cdot EG_{Aux,y} (\%)$$

Where

$EG_{FF,Gross,y}$ = The gross electricity generation from the combustion of fossil fuels during the year y (MWh/y)

$EG_{Aux,y} (\%)$ = The percentage of auxiliary electricity consumption of the project activity during the year y (%)

Option 2 (Vide No6 of AMS- I.D. Version 16 Clause 22):

'The amount of electricity generation calculated using specific fuel consumption and amount of each type of biomass fuel used'.

$$EG_{b,y} = EG_{BF,Gross,y} - EG_{BF,Aux,y}$$

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Where,

EG_y = The amount of electricity generation calculated using specific energy consumption of each type of biomass fuels used during the year y (MWh/y)

$EG_{BF,Gross,y}$ = The gross electricity generation from the combustion of biomass fuels during the year y (MWh/y)

$EG_{BF,Aux,y}$ = The corresponding amount auxiliary electricity consumption for the electricity generated from the combustion of biomass fuels (MWh/y)

$$EG_{BF,Gross,y} = \frac{BF_{k,y} \times GCV_{k,y}}{SEC_{k,y}}$$

Where

$BF_{k,y}$ = Quantity of biomass fuel type k combusted in the project activity during the year y (in Tons)

$SFC_{k,y}$ = Specific fuel consumption of the biomass fuel type k combusted in the project activity during the year y (in TJ/MWh)

$GCV_{k,y}$ = Gross calorific value of each fuel type combusted in the project during the year y (TJ/Ton)

$$EG_{BF,Aux,y} = EG_{BF,Gross,y} \cdot EG_{Aux,y} (\%)$$

Where

$EG_{BF,Gross,y}$ = The gross electricity generation from the combustion of biomass fuels during the year y (MWh/y)

$EG_{Aux,y} (\%)$ = The percentage of auxiliary electricity consumption of the project activity during the year y (%)

The energy value considered for estimation of baseline emissions is of is lower of $EG_{b,y}$ and $EG_{a,y}$

Calculation of grid or CO₂Emission factor

Based on the methodology, AMS-I.D. Version 16, the grid emission factor can be calculated as either any one of the following options in a transparent and conservative manner:

- (a) Combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in “**Tool to calculate the emission factor for an electricity system**”.

OR

- (b) The weighted average emissions (in kg CO₂equ/kWh) of the current generation mix.

The project proponent has selected approach (a), i.e., combined margin emission factor. The emission factor is determined using the procedures described in the Version 02 “**Tool to calculate the emission factor for an electricity system**”.

The baseline data have been taken from the Baseline Carbon Dioxide Emission Database with reference to Version 5.0 , Nov 2009 by the Central Electricity Authority (CEA) (which is an official source of Ministry of Power, Government of India) have worked out baseline emission factor for various grids in India and made them publicly available, vide web link :

http://www.cea.nic.in/reports/planning/cdm_co2/database_publishing_ver5.zip

As per “tool “, seven steps therein are applied to calculate the emission factor:

Step 1: Identify the relevant electricity systems.

The project, being setup in the state of Tamil Nadu , falls under Southern regional grid of India and the electricity generated by this project will be fed to southern regional grid. Hence, in the case of this project activity, the project electricity system is the Southern grid of India. Due to the displacement of electricity the project activity would have impact on the southern grid, serving the four southern states and one union territory namely Pondicherry. Hence the project also has an impact on all the generation facilities in the southern grid. All the electricity generating units connected to the system would be part of the boundary for estimation of baseline emissions. In the absence of this CDM project activity, equivalent amount of electricity would be generated from the new or existing power plants connected to southern regional grid.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional).

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

Following the calculations of the CEA, and the statistical data available, Option I is chosen.

For the baseline calculation a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) are used.

Step 3: Select a method to determine the operating margin (OM)

According to the tool, four various methods are provided for calculating the operating margin emission factor ($EF_{grid,OM,y}$), including:

- a) Simple Operating Margin;
- b) Simple Adjusted Operating Margin;
- c) Dispatch data analysis Operating Margin;
- d) Average Operating Margin;

According to the tool, the Simple OM method (a) is applicable to the project if the low-cost resources constitute less than 50% of total grid generation during the last 5 years .

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The Simple OM method selected by the PP is justified and appropriate as the average proportion of low-cost/must run resources as average of 5 years data ,(2004-05 -16.84%, 2005-06 – 27.0%, 2006-07 – 28.3 % ,2007-08 – 27.1 % & 2008-09-22.8 %) is 25.3 %²⁵ (<50%). Low operating cost/must run resources include hydro, wind, low-cost biomass and nuclear in the western region grid of India. Coal is the pre-dominant fuel source but not obviously used as ‘must-run’ in India whereby any chance the coal based generation is displaced by less GHG emitting sources

The tool provides two options – (i) ex-ante option and (ii) ex-post option in calculating the simple OM. The PP has chosen the ex-ante option for determining the OM without the necessity to recalculate during the chosen crediting period. The choice of ex-ante option with a 3-year generation weighted average value, based on the most recent data available at the time of submission of the CDM-SSC-PDD to the DOE for validation

Step 4: Calculate the operating margin emission factor according to the selected method.

This step requires the calculation of the operating margin emission factor according to the selected method. ‘Selected method’ in this context is the ‘Simple OM’ chosen

Operating Margin (OM)

Most recent three years	2006-07	2007-08	2008-09
Operating Margin* (OM) in t CO ₂ / MWh	0.99912	0.99062	0.97292
Net Generation in Operating Margin (MWh)	109,116,378	114,701,739	121,471,251
Average of 3 years in t CO ₂ / MWh	0.98708		

²⁵ http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

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* including import

Source : [CDM - Carbon Dioxide baseline database](#) Version 5.0 Nov 2009 Published by CEA

Step 5: Identify the group of power units to be included in the build margin

The sample group of power units “m” used in the referred CEA’s CO₂ baseline database to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently. The calculations are based on generation, fuel consumption and fuel quality data obtained from the power stations.

Project participants can choose in terms of vintage of data among the two options as given in tool and the option 1 has been chosen for the project activity :

For the arrival of build Margin: Option 1 is selected. The Build margin emission factor has been calculated *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of the power plant capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

Step 6: Calculate the build margin emission factor

Build Margin (BM)

The build margin emissions factor is the generation-weighted average emission factor (tCO₂/MWh) of all power units *m* during the most recent year *y* for which power generation data is available.

The build margin emission factor for the year 2008-2009, latest as available was used for an ex-ante estimation of emission reduction estimates for the first crediting period.

The Build Margin for the Southern Regional Grid, not adjusted for imports as calculated and made publicly available by CEA is given below:

Build Margin (BM) for 2008-09	0.81792	tCO ₂ /MWh
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For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Step 7: Calculate the combined margin emissions factor

The combined margin emission factor is calculated as

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where

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- $EF_{grid, BM, y}$ = Build margin CO₂ emissions factor in year y (tCO₂/MWh)
- $EF_{grid, OM, y}$ = Operating margin CO₂ emissions factor in year y (tCO₂/MWh)
- w_{OM} = Weighting of operating margin emissions factor (%)
- w_{BM} = Weighting of build margin emissions factor (%)

With the default weights applicable for the proposed project types, the values used for $w_{OM} = 0.5$ and $w_{BM} = 0.5$ for the crediting period the combined margin emission factor for the Southern regional Grid comes out as:

$$\begin{aligned}
 EF_{grid, CM, y} &= (0.98702 \times 0.5) + (0.81792 \times 0.5) \text{ t CO}_2/\text{MWh} = 0.90250 \text{ t CO}_2/\text{MWh} \\
 &= 902.50 \text{ t CO}_2/\text{GWh} \\
 &= EF_{CO_2, grid, y}
 \end{aligned}$$

Combined Margin (CM) is the average of OM and BM	0.90250	tCO ₂ /MWh
	902.50	tCO ₂ /GWh

The arrived CO₂ grid emission factor by Combined Margin approach is fixed ex ante for the first crediting period.

Note:- The default values to be considered for the second and third crediting period $w_{OM} = 0.25$ and $w_{BM} = 0.75$ as stipulated in the tool.

Project emissions

The possible project emissions for biomass based power project would include

- CO₂ emissions due to combustion of fossil fuels that attributable to project activity (other than those used in boiler, like in DG set)
- CO₂ emissions from fossil fuel usage in transportation of biomass residues to the project site .

The following equation is used to calculate the total project emissions of the project activity during the year y.

$$PE_y = PEFF_y + PET_y$$

Where

$PEFF_y$ = CO₂ emissions during the year y due to other fossil fuel (diesel for DG set) consumption at the project site that is attributable to the project activity (tCO₂/yr)

PET_y = CO₂ emissions during the year y due to transport of the biomass residues to the project site. (tCO₂/yr).

Project emissions due to the combustion of fossil fuels (DG set – $PEFF_y$)

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The CO₂ emissions from combustion of fossil fuels in the project plant ($PE_{FC,j,y}$) should be calculated using the latest approved version of the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion”, Version 02, where the process j in the tool corresponds to the combustion of fossil fuels in the project plant. CO₂ emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO₂ emission coefficient of those fuels, as follows:

$$PE_{FF,y} = PE_{FC,j,y}$$

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

Where:

$PE_{FC,j,y}$ = are the CO₂ emissions from fossil fuel combustion in process j during the year y (tCO₂/yr);

$FC_{i,j,y}$ = is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);

$COEF_{i,y}$ = is the CO₂ emission coefficient of fuel type i in year y (tCO₂/mass or volume unit);

i = are the fuel types combusted in process j during the year y .

The CO₂ emission coefficient $COEF_{i,y}$ can be calculated using one of the following two Options as provided in the above said tool, depending on the availability of data on the fossil fuel type i , the project has adapted **Option B**:

The CO₂ emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO₂ emission factor of the fuel type i , as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO_2,i,y}$$

Where:

$COEF_{i,y}$ = is the CO₂ emission coefficient of fuel type i in year y (tCO₂/ mass or volume unit);

$NCV_{i,y}$ = is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit);

$EF_{CO_2,i,y}$ = is the weighted average CO₂ emission factor of fuel type i in year y (tCO₂/GJ);

i = are the fuel types combusted in process j during the year y .

For the proposed project with only one type of fuel i.e. Diesel would be used in a diesel generator of capacity to meet the emergency requirements of power house etc. Emissions due to use of fossil fuel (diesel) will be accounted as project emissions based on the following equation:

In summation, the project emissions due to use of fossil fuel (diesel) in the project activity will be evaluated using the following equation:

$$PE_{FC,d,y} = (FC_{d,y} \times \rho_d \times NCV_{d,y} \times EF_{CO_2,d,y}) / 10^6$$

Project emissions due to combustion of fossil fuels for transportation of biomass residues to the project site during the year y (PET_y)

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As the biomass residues are not generated at the site but are collected from an area of 50 km radius, project emissions due to combustion of fossil fuels for transportation are considered. The emissions are calculated based on the distance of travel and average truck load

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} \times AVD_y \times EF_{km,CO_2,y}$$

Where,

- PET_y = CO₂ emissions during the year y due to transport of the biomass residues to the project plant (tCO₂/yr)
- AVD_y = Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year y (km)
- $EF_{km,CO_2,y}$ = Average CO₂ emission factor for the trucks measured during the year y (tCO₂/km)
- $BF_{T,k,y}$ = Quantity of biomass residue type k that has been transported to the project site during the year y (Tons)
- TL_y = Average truck load of the trucks used (Tons) during the year y
- k = Types of biomass residues used in the project plant and that have been transported to the project plant in year y

$$EF_{km,CO_2,y} = (NCV_{d,y} \times EF_{CO_2d,y} \times \rho_d) / (\text{Avg. Mileage of truck} \times 10^6)$$

Leakage

The methodology requires leakage consideration if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity.

The project activity uses new biomass based power generation equipment, therefore the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity. Therefore no leakage is considered

As of the project is biomass based power project, the main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion or other sources due to diversion of biomass residues from other uses to the project plant as a result of the project activity; i.e. the competing use of the biomass residues according to *Attachment C to Appendix B indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories* “General guidance on leakage in biomass project activities.” (Version 03)

As there is a mix of fuels being used the project participant shall evaluate *ex ante* if there is a surplus of the biomass in the region of the project activity, which is not utilized to demonstrate the leakage for the fuels. A survey has to be conducted ex-ante by the project participants at the beginning of each crediting period to ensure that the implementation of project activity does not lead to any increase in GHG emission from fossil fuel combustion or other sources due to the competing use of biomass residues from the other uses to the project as a result of the project activity.

During such evaluation the surplus availability of the biomass in the region of the project activity is at least 25% larger than the quantity of biomass that is utilized including the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions.

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If, the quantity of surplus biomass in the region is found below the 25% of the quantity of the biomass that is utilized including the project activity at the beginning of the crediting period the corresponding percentage of biomass quantity would be considered to estimate the leakage emissions due to the competing uses of biomass, as briefed below and deducted from the emission reductions calculated for that crediting period .

Estimation of Leakage emissions

A fuel availability survey will be carried out at the beginning of each crediting period to assess the surplus availability of biomass in the project region. If it is found that the surplus in the region is less than 25% of the total region consumption, the emissions due to leakage will be estimated and deducted from the emission reductions by applying the following equation.

$$LE_y = EF_{CO_2,LE} \times \sum_k BF_{LE,k,y} \times NCV_{k,y}$$

LE_y	=	Leakage emissions during the year y (tCO ₂ /y)
$EF_{CO_2,LE}$	=	CO ₂ emission factor of the most carbon intensive fuel used in country (tCO ₂ /TJ)
$BF_{d,y1}$	=	Quantity of biomass residue type k used for heat generation as a result of the Project activity during the year y and for which leakage cannot be ruled out using approach ‘competing uses for the biomass’ of Attachment C (Tons)
$NCV_{k,y}$	=	Net calorific value of the biomass type k during the year y (TJ/Ton)
k	=	biomass residue type used in the project activity

Emission Reductions:

The emission reductions estimated from the project activity are the difference between baseline emissions, project emissions and leakage. The formulae for calculating the emission reductions are provided below:

$$ER_y = BE_y - PE_y - LE_y$$

The calculations are provided in Sec B.6.3 of this documentation

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

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO ₂ /MWh
Description:	$EF_{grid,CM,y}$ is the Grid Emission Coefficient calculated in a transparent and conservative manner as Combined Margin (CM) which is the combination of Operation Margin (OM) and Build Margin (BM) (OM & BM have been calculated ex-ante) for the southern grid.
Source of data used:	CEA published data for OM & BM in calculating the CM CO₂ Baseline Database, version 5.0 dated November, 2009
Value applied:	Calculated as under : $EF_{grid,CM,y} = 0.5 * EF_{grid,OM,y} + 0.5 * EF_{grid,BM,y}$ $= 0.5 \times 0.98708 + 0.5 \times 0.81792$

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	= 0.90250
Justification of the choice of data or description of measurement methods and procedures actually applied :	The $EF_{grid,CM,y}$ calculation is based on the guidelines in “Tool to calculate the emission factor for an electricity system” (Version 02, EB 50)
Any comment:	As the calculation of baseline emission has been done <i>ex ante</i> its value will remain fixed for the first crediting period

Data / Parameter:	$EF_{grid,om,y}$
Data unit:	tCO ₂ /MWh
Description:	Operating margin CO ₂ emission factor for the (southern) grid connected power generation in year y
Source of data used:	CEA CO ₂ data base Version .05, Nov 2009 http://www.cea.nic.in/reports/planning/cdm_co2/database_publishing_ver5.zip
Value applied:	0.98708
Justification of the choice of data or description of measurement methods and procedures actually applied :	Central Electricity Authority is a government body which calculates the grid emission factors for Indian power sector as per the prepared data.
Any comment:	This database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done <i>ex ante</i> its value will remain fixed for the crediting period.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO ₂ /MWh
Description:	Build margin CO ₂ emission factor for the (southern) grid connected power generation in year y
Source of data used:	CEA CO ₂ data base Version .05 , Nov 2009 http://www.cea.nic.in/reports/planning/cdm_co2/database_publishing_ver5.zip
Value applied:	0.81792
Justification of the choice of data or description of measurement methods and procedures actually applied :	Central Electricity Authority is a government body which calculates the grid emission factors for Indian power sector.
Any comment:	This database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the

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	Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done <i>ex ante</i> its value will remain fixed for the entire crediting period.
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Data / Parameter:	Specific Energy consumption(SEC)
Data unit:	TJ/MWh
Description:	Specific energy consumption of each type of fuel
Source of data used:	Estimated exclusively for the project activity based on fuel mix , calorific values , station heat rate.
Value applied:	0.01650(Calculated)
Justification of the choice of data or description of measurement methods and procedures actually applied :	As there is no published data on SEC for biomass power projects the PP has estimated the Specific energy consumption (SEC) based on station heat rate value. Calculations for the same are furnished to DOE for verification.
Any comment:	The arrived specific energy consumption of each type of biomass fuels / fossil fuel(coal) are specified <i>ex ante</i> . However the consumption of each type of biomass / fossil fuels will be monitored

Data / Parameter:	EG_{BLy}
Data unit:	MWh
Description:	Quantity of net electricity supplied to the grid in year y
Source of data used:	Ex ante estimates
Value applied:	See sec B.6.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The parameter is evaluated as per the formulae described in Sec B.6.1 of this documentation.
Any comment:	The lower of the value as derived based on approaches mentioned in B.6.1 will be considered for baseline estimations.

Data / Parameter:	$NCV_{d,y}$
Data unit:	GJ/mass or volume unit
Description:	CO ₂ emission factor of each fuel type i
Source of data used:	IPCC 2006 default values http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value applied:	Diesel : 43.3 (Source: IPCC)
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC 2006 values (95% confidence interval) have been used for diesel since no country specific data is available. Future revision of the values would be accounted during <i>ex post</i> .
Any comment:	--

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Data / Parameter:	ρ_d
Data unit:	kg/Litre
Description:	Density of the fossil fuel used for the project site (Diesel)
Source of data used:	Society of Indian automobile manufacturers http://www.siamindia.com/scripts/Diesel.aspx
Value applied:	0.82
Justification of the choice of data or description of measurement methods and procedures actually applied :	The SIAM value is considered as it is publicly available and can be referred as authentic source. Future revision of the values would be accounted during ex post.
Any comment:	--

Data / Parameter:	$EF_{CO_2,d,y}$
Data unit:	tCO ₂ /TJ
Description:	CO ₂ emission factor of fuel type <i>i</i> in year <i>y</i> (tCO ₂ /TJ)
Source of data used:	IPCC 2006 values http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf
Value applied:	74.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC 2006 values(95% confidence interval) have been used for diesel and any future revision of the IPCC Guidelines should be taken into account and review the appropriateness of the data annually
Any comment:	--

Data / Parameter:	$BF_{surplus,y}$
Data unit:	% (percentage)
Description:	Surplus quantity of available biomass upon the total quantity of biomass consumption in the project region including the project activity during the year <i>y</i>
Source of data used:	Public survey documentation in the region, if not available, project participants shall voluntarily appoint a third party to conduct the assessment study.
Value applied:	47.28 % [Evaluated based on the third party carried out biomass assessment study in the project region. For details see under Leakage in B.6.3 of the PDD]
Justification of the choice of data or description of measurement methods and procedures actually applied :	The parameter is a calculated value derived from the biomass assessment study carried out and evaluated ex-ante at the beginning of the crediting period renewal. The project participants has ex ante assessed the surplus availability of biomass at the beginning of crediting period, based on the public survey documentations available in the project region.

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Any comment:	The value is applied for ex ante leakage emission estimation due to competing use of biomass for the crediting period. The same will be determined at the beginning of each crediting period.
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Data / Parameter:	EF_{km,CO_2}
Data unit:	tCO ₂ /km
Description:	Average CO ₂ emission factor for the trucks measured during the year y (tCO ₂ /km)
Source of data used:	local data if available & 2006 IPCC values
Value applied:	0.00059
Justification of the choice of data or description of measurement methods and procedures actually applied :	<p>Calculate CO₂ emissions from fuel consumption by multiplying with appropriate net calorific values and CO₂ emission factors. base on the above sourced parameters the factor is calculated</p> $EF_{km,CO_2,y} = (NCV_{d,y} \times EF_{CO_2d,y} \times \rho_d) / (\text{Avg. Mileage of truck} \times 10^6)$ <ul style="list-style-type: none"> - Detail of the data used: - NCV of diesel = 43.3 TJ/Gg - CO₂ e mission factor of diesel = 74.8 tCO₂/TJ - Fuel consumption for diesel vehicles = 4.5 km/litre²⁶ - Density of diesel = 0.82 kg/lit <p>ie $EF_{km,CO_2} = (0.82 \times 43.3 \times 74.8) / (4.5 \times 10^6) = 0.00059$</p>
Any comment:	Check consistency of measurements and local / national data with default values by the IPCC . Any future revision of the local data or IPCC Guidelines shall be taken into account annually.

Data / Parameter:	$EF_{CO_2,LE}$
Data unit:	tCO ₂ /TJ
Description:	CO ₂ emission factor of the most carbon intensive fuel used in the country
Source of data used:	Initial National Communication to UNFCCC (INC) CEA database Version 04 , Set 2008
Value applied:	Lignite : 106.2 (Source: INC)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data published in India's initial national communication (INC) is the authenticated and represents the national average values. Hence, the emission factor value is considered from INC.
Any comment:	The above value would be applied only if the leakage (biomass) found in the project region at the beginning of the crediting period.

B.6.3 Ex-ante calculation of emission reductions:

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²⁶ India Road transport service efficiency study by World Bank, Nov 05 . <http://www.worldbank.org/transport/transportresults/regions/sar/rd-trans-final-11-05.pdf>

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The *ex-ante* calculations of the emission reductions are given below. The applicable formulae are as described in section B.6.1.

Base parameters considered for calculations:

- Step 1:- Gross electricity generation = $10 \times 365 \times 24 \times 80\% = 70,080 \text{ MWh}$
- Step 2:- Auxiliary consumption @ 10% = $70,080 \times 10\% = 7,008 \text{ MWh}$
- Step 3:- Exportable power = $63,072 \text{ MWh}$
- Step 4:- Import from the grid = 0 MWh
- Step 5:- Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity = $63,072 - 0 = 63,072 \text{ MWh}$

Step 6:- The Station Heat Rate (SHR) of the plant is $3940 \text{ kcal/kWh}^{27}$ and the same has been used for the estimation of the specific energy consumption and there by the electricity generation from the fuel type.

Table B.1 Parameters Considered for Calculations

OPTION 1	OPTION 2			
Based on the annual coal consumption, the power generated using coal is calculated as below:- $FF_{i,y} = 12,306 \text{ tons} ; SEC_{i,y} = 0.0165$ $EG_{FF, Gross,y} = (12,306 \times 0.0157) / 0.0165 = 11,728.00 \text{ MWh}$ $EG_{FF, Aux.,y} = 10\% \times 11,728 = 1,173 \text{ MWh}$ $EG_{FF,y} = 11,728 - 1,173 = 10,555 \text{ MWh}$ $EG_{a,y} = 70,080 - 10,555 = 59,525 \text{ MWh}$	The selected design fuel mix is Coconut residues , Juliflora, saw dust, & sugar cane trash as per the assessment for the biomass Hence quantity of each type of fuel fired per annum in the project activity is calculated by multiplying annual fuel requirement with envisaged fuel mix's .			
	Coconut residues	Juliflora	Saw dust & wood chips	Sugar cane trash
Quantity (in Tons) -- ---(a)	24,611	20,509	16,407	8,204
GCV (TJ/Ton)--- (b)	0.0147	0.0136	0.0134	0.0126
SEC (TJ/MWh)- --(c)	0.0165	0.0165	0.0165	0.0165
	$EG_{BF, Gross,y} = \sum(a \times b) / c = 58,352 \text{ MWh}$ $EG_{BF, Aux.,y} = 10\% \times 58,352 = 5,836 \text{ MWh}$ $EG_{b,y} = 58,352 - 5,836 = 52,516 \text{ MWh}$			
The lower of two values should be used to calculate the emission reductions. $BE_y = EG_{BL,y} * EF_{CO2,grid,y}$				

²⁷ The station heat rate depends on factors such as plant capacity, plant design and its configuration, technology employed (boiler type and pressure levels), plant O&M practices, quality and type of fuel received etc. While determining tariff for biomass power projects, most of the state Electricity regulatory commissions are considering water-cooled condensing system wherein the SHR is 3650 to 3700 kcal/kWh. It is evident that about 240 kcal/kWh addition heat is required for the biomass power project with air-cooled condensing system vide web link [http://www.erc.gov.in/Order/JS_\(PO\)_Order_RE_Tariff_15.03.07.pdf](http://www.erc.gov.in/Order/JS_(PO)_Order_RE_Tariff_15.03.07.pdf) .

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$$= 52,516 \times 0.90250 = 47,395 \text{ tCO}_2$$

Project emissions

- CO₂ emissions due to combustion of fossil fuels that attributable to project activity (other than those used in boiler, like in DG set) evaluated using the following equation:

$$PE_{FC,y} = (FC_{d,y} \times \rho_d \times NCV_{d,y} \times EF_{CO_2,d,y}) / 10^6$$

$$= (0 \times 0.82 \times 43.3 \times 74.8) / 10^6 = 0 \text{ tCO}_2$$

Project emissions from the use of DG set would be taken as zero as the plant has not been commissioned yet, however, they would be accounted for, if and when used, once the plant is implemented and is in operation.

- CO₂ emissions from transportation of biomass residues to the project site.

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} \times AVD_y \times EF_{km,CO_2,y}$$

$$EF_{km,CO_2,y} = 0.00059 \text{ tCO}_2/\text{km} \text{ (refer table in sec B.6.2 above)}$$

$$PET_y = [(69,731/10) \times 100] \times 0.00059$$

$$= 412 \text{ tCO}_2$$

Therefore

$$PE_y = 412 + 0 = 412 \text{ tCO}_2e$$

Leakage:

As per General guidance on leakage in biomass project activities Version 03 EB 47 the emission source per type of biomass is given in the table below:

Biomass Type	Activity/Source	Shift of pre-project activities	Emissions from biomass generation / cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	X
	New forests	X	X	-
Biomass from croplands or grasslands (woody or non woody)	In the absence of the project the land would be used as cropland/wetland	X	X	-
	In the absence of the project the land would be abandoned	-	X	-
Biomass residues or wastes	Biomass residues or wastes are collected and used	-	-	X

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Since the project activity uses coconut residues, sugarcane trash, prosopis juliflora, saw dust and these fall under the type of residues/wastes, competing use of biomass have been considered and demonstrated:

The project participant shall evaluate *ex ante* if there is a surplus of the biomass in the region of the project activity, which is not utilized. If it is demonstrated (e.g., using published literature, official reports, surveys etc.) at the beginning of each crediting period that the quantity of available biomass in the region (e.g., 50 km radius), is at least 25% larger than the quantity of biomass that is utilized including the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions.

If the quantity of available biomass in the region (e.g. 50 km radius), is at least 25% larger than the quantity of biomass that is utilized including the project activity, then the source of leakage can be neglected. If it is found that the project leads to leakage affect, the emissions due to leakage will be estimated based on the equation provided in section B.6.1. and deducted from baseline emission if >10% of emission reductions.

The project proponent had engaged the third party services ie ABI Energy Consultancy services Private Limited for the biomass assessment in the project region as per the Assessment Report, the total generation of fuel biomass residues in the project region is 1.059 million tons (mt), where as the consumption of the region including project activity is 0.719 mt. The surplus biomass available is 0.340 mt. The leakage calculation is demonstrated in the below table:

Table B.2 Leakage demonstration

Type	Generation	Consumption (incl Project activity)	Surplus	
	Tons/yr	Tons/yr	Tons/yr	%
Coconut residues	642768	410272	232496	56.67
Juliflora	257374	200671	56703	28.26
Saw dust & wood chips	101115	77076	24039	31.19
Sugarcane trash	58724	31694	27030	85.29
Total	1059981	719713	340268	47.28

The surplus biomass in the region is ~ 47 % larger than the total fuel consumption in the region. Hence, the leakage emissions due to competing use of biomass is neglected. The leakage affect due to competing uses of biomass will be monitored at the beginning of the each crediting period to ensure that the implementation of project activity does not lead to any increase in GHG emissions from fossil fuel combustion or other sources due to diversion of biomass residues from the other uses to the project as a result of project activity.

As the applied methodology AMS-I.D. covers the use of multiple renewable biomass sources, additional type biomass fuels like field level residues, plantation crop residues, agro industrial residues as available which also falls in the renewable biomass category and these can be used during the operation stage of the project activity as per seasonal availability, availability with in short distance and affordable prices, where it can be demonstrated that there is no leakage in

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accordance with the guidance for leakage in biomass project activities as per approve methodology clarification SSC_227.

$$LE_y = 0 \text{ tCO}_2\text{e}$$

Conclusively, the leakage of the project activity is zero.

Emission reductions

$$ER_y = BE_y - PE_y - LE_y$$

$$= 47,395 - 412 - 0 = 46,983 \text{ tCO}_2\text{e}$$

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

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Year	Estimation of project activity emissions (t CO ₂ e)	Estimation of baseline emissions (t CO ₂ e)	Estimation of leakage (t CO ₂ e)	Estimation of overall emission reductions (tCO ₂ e)
2011	412	47,395	0	46,983
2012	412	47,395	0	46,983
2013	412	47,395	0	46,983
2014	412	47,395	0	46,983
2015	412	47,395	0	46,983
2016	412	47,395	0	46,983
2017	412	47,395	0	46,983
Total (tonnes of CO ₂ e)	2,884	331,765	0	328,881

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EG _{Gross,y}
Data unit:	MWh/y
Description:	Total quantity of gross energy generated in the project activity during the year y
Source of data to be used:	On-site measurements
Value of data	70,800 (Projected)
Description of measurement methods and procedures to be applied:	The parameter is measured in continuous using calibrated meter located in the plant premises and the hourly or daily and monthly sub-totals will be recorded in the plant books.
QA/QC procedures to be applied:	The consistency of metered electricity generation will be cross-checked with the quantity of biomass and coal fired. The Meters used for reading the Gross energy calibrated according to the standard for energy meters and recalibrated at appropriate intervals . The frequency of re calibration will be at least once in three years as per version 17 of SSC _CDM guidelines paragraph 17(c), Annex 21 EB 61. The accuracy class of meters would be of

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	0.5.
Any comment:	--

Data / Parameter:	EG_{exported}
Data unit:	MWh/y
Description:	Electricity export/supply to grid by the project activity during the year y
Source of data to be used:	Readings of Main meter and /or Check meters ²⁸ installed at inter connection point/grid interface used for billing purposes ie Joint Meter Reading (JMR) statements & other plant records.
Value of data	63,072 (Projected)
Description of measurement methods and procedures to be applied:	The quantity of electricity exported to grid will be continuously monitored. Frequency of the meter reading and reporting is once in a month and aggregated annually.
QA/QC procedures to be applied:	Meters will be provided as per EPA, the re-calibration at appropriate intervals ²⁹ but at least once in three years as per SSC_CDM_guidelines (Ver 17). Sales records to the grid and other records are used to ensure consistency. The meters would be of 0.2 class accuracy.
Any comment:	Electric energy exported will be measured by Main Meter and/or Check Meter as specified in the EPA and records will be maintained. To be cross-checked with monthly invoices or receipts of payments.

Data / Parameter:	$EG_{\text{import,y}}$
Data unit:	MWh/y
Description:	Onsite electricity consumption of the project activity imported from the grid system during the year y
Source of data to be used:	Readings of Main meter and /or Check meters ³⁰ installed at inter connection point/grid interface used for billing purposes Joint Meter Reading (JMR) statements.
Value of data	0 (projected)
Description of measurement methods and procedures to be applied:	The quantity of electricity imported from grid will be continuously monitored. Frequency of the meter reading and reporting is once in a month and aggregated annually.
QA/QC procedures to be applied:	Same as adapted for the parameter EG_{exported}
Any comment:	Same as adapted for the parameter EG_{exported}

Data / Parameter:	$F_{\text{procured,y}}$
Data unit:	Tons

²⁸ The standby meters or check meters if any installed also form a part of the monitoring plan and will be used in case the main meters are not working.

²⁹ In accordance with published Central Electricity Authority's Notification dated 17 March, 2006, all interface (Main & Check) meters shall be tested at least once in five years (Para 18(1) (b) vide web link http://www.cea.nic.in/e&c/regulations/notified_regulations/Metering_Regulations.pdf).

³⁰ The standby meters or check meters if any installed also form a part of the monitoring plan and will be used in case the main meters are not working.

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Description:	Quantity of fuel types procured for the project activity during year y
Source of data to be used:	Plant records
Value of data	82,037 (projected value)
Description of measurement methods and procedures to be applied:	The trucks carrying fuel (biomass residues and fossil fuel) weighted by a calibrated weighbridge twice upon entry and exit to arrive at the net quantity of fuel procured. The weighbridge would be located in the plant premises and the monitoring frequency is of continuous
QA/QC procedures to be applied:	The weigh bridge meter under goes periodically calibration as per the manufacturer specifications or by the specified agencies by the weights & measures department of legal metrology of the state. This data will be cross checked against purchase receipts and inventory data. The calibration frequency of weighbridge would be annually.
Any comment:	The data on quantity of fuel purchased will be collected, recorded and archived separately for all types of fuels. Data archiving is two years after the end of this crediting period

Data / Parameter:	$BF_{k,y}$
Data unit:	Tons
Description:	Quantity of biomass residue type k combusted in the project plant during year y
Source of data to be used:	On-site records
Value of data	69,731
Description of measurement methods and procedures to be applied:	The trucks carrying fuel (biomass residues) weighted by a calibrated weighbridge twice upon entry and exit to arrive at the net quantity of fuel procured. The total quantity of biomass fuel procured for the project purpose will be completely combusted in the power plant. Hence, the total quantity of biomass fuel procured and quantity of biomass fuel combusted is considered as same for the project activity. The data on quantity of biomass residues procured will be collected separately for each type of biomass residues.
QA/QC procedures to be applied:	The weigh bridge meter under goes periodically calibration as per the manufacturer specifications or by the specified agencies by the weights & measures department of legal metrology of the state. The data recorded at weigh bridge in log books can be cross checked against the purchase receipts and stock records. It is monitored continuously or estimate using annual energy/ mass balance.
Any comment:	Each type of biomass will be weighed and the total quantity would be the sum total of each type of biomass fuel. Data archiving; two years after crediting period

Data / Parameter:	$FC_{i,y}$
Data unit:	Tons
Description:	Quantity of fossil fuel (coal if used) type i combusted in the project plant during year y
Source of data to be used:	On-site records

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Value of data	12,306(projected for ex-ante emission estimates)
Description of measurement methods and procedures to be applied:	The trucks carrying coal weighted by a calibrated weighbridge twice upon entry and exit to arrive at the net quantity of fuel procured. The total quantity of fossil fuel procured for the project purpose will be completely combusted in the power plant. Hence, the total quantity of fossil fuel procured and quantity of fossil fuel combusted is considered as same for the project activity, the same can be cross checked from procured and stock records. It is monitored continuously or estimate using annual energy/ mass balance.
QA/QC procedures to be applied:	The weigh bridge meter under goes periodically calibration as per the manufacturer specifications or by the specified agencies by the weights & measures department of legal metrology of state .The data recorded can be cross checked against the fuel purchase receipts.
Any comment:	The data on quantity of coal procured would be collected separately. Data archiving : Crediting period + two years.

Data / Parameter:	$NCV_{i,y}$
Data unit:	kcal/kg or TJ/Gg
Description:	Net calorific value of fossil fuel type(coal) <i>i</i> combusted in the project activity during the year <i>y</i>
Source of data to be used:	Fuel Test reports
Value of data	Ex post Monitored data
Description of measurement methods and procedures to be applied:	The samples of fossil fuel type will be collected from the plant according to the procedures of sample collection and measurements will be undertaken in line with national or international fuel standards.
QA/QC procedures to be applied:	Checking the consistency of the measurements by comparing the measurement results with measurements from previous years (if any) relevant data sources.If measurement results differ significantly from previous , conduct additional measurements
Any comment:	The Net calorific value is of 5 percent less than the Gross calorific value as per IPCC 2006 guidelines ³¹ , either of the value can be determined if other is known.

Data / Parameter:	$NCV_{k,y}$
Data unit:	kcal/kg or TJ/Gg
Description:	Net calorific value of biomass residue type <i>k</i>
Source of data to be used:	Determined values from Lab analysis/from authentic sources.
Value of data	Ex post Monitored data
Description of measurement methods and procedures to be applied:	Samples of each fuel type would be collected from the plant according to the procedures of sample collection and where measurements carried out according to relevant national/international standards. Energy content test will be carried out annually.

³¹ http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

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QA/QC procedures to be applied:	Checking the consistency of the measurements by comparing the measurement results with measurements from previous years (if any) relevant data sources. If measurement results differ significantly from previous , conduct additional measurements
Any comment:	The Net calorific value is of 5 percent less than the Gross calorific value as per IPCC 2006 guidelines ³² , either of the value can be determined if other is known.

Data / Parameter:	Moisture
Data unit:	%
Description:	Moisture content of the biomass
Source of data to be used:	Determined values from Lab records
Value of data	Ex post determined data
Description of measurement methods and procedures to be applied:	Samples of biomass fuel of homogeneous quality will be monitored The frequency is of monthly basis .
QA/QC procedures to be applied:	The weighted average be calculated for each monitored period
Any comment:	In case of dry biomass, monitoring of the same parameter is not required.

Data / Parameter:	FF _{d,y}
Data unit:	litre
Description:	Quantity of fossil fuel type (diesel) <i>i</i> combusted in the project plant during year <i>y</i>
Source of data to be used:	On-site records (ex DG set log book, fuel issue log books) recorded
Value of data	0 (assumed value for ex-ante calculation of emission reductions)
Description of measurement methods and procedures to be applied:	Quantity of fuel used (diesel) used would be measure using a dip stick. To be measured on a monthly basis or every time the DG set is run on load, whichever is earlier or the operating hours and the quantity of diesel consumption will be recorded.
QA/QC procedures to be applied:	The data recorded can be cross checked against the fuel purchase receipts.
Any comment:	Data archived: Crediting period + two years. Instruments : Dip Stick

Data / Parameter:	TL _y
Data unit:	Tonnes per truck
Description:	Average truck load of the trucks used for transportation during the year <i>y</i>
Source of data to be used:	On site measurement at weigh bridge of plant
Value of data	10(Assumed)
Description of	This data would be obtained from the weigh bridge measurements on-site

³² http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

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measurement methods and procedures to be applied:	twice upon truck entry and exit.
QA/QC procedures to be applied:	The weigh bridge meter under goes periodically calibration as per the manufacturer specifications or by the specified agencies by the weights & measures department of legal metrology of state.
Any comment:	Monitored continuously and collated monthly the mean value is considered in annual estimates.

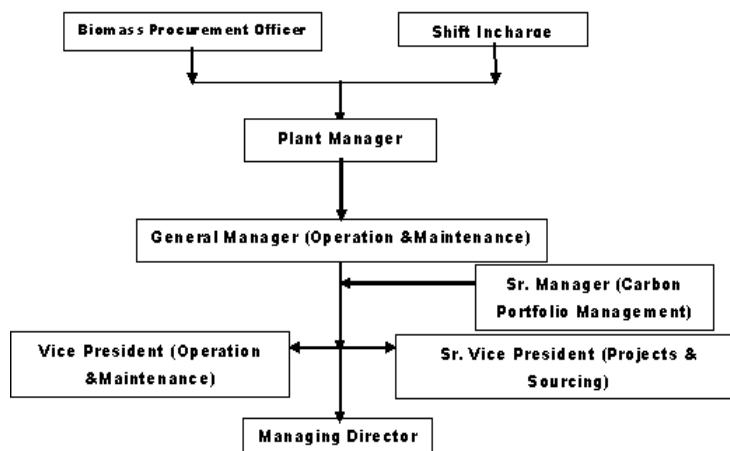
Data / Parameter:	AVD _y
Data unit:	km
Description:	Average round trip distance (from and to) between biomass fuel supply sites and the project site
Source of data to be used:	On site records maintained at project site (log books)
Value of data	100
Description of measurement methods and procedures to be applied:	Biomass: The data is recorded at the plant premises based on the information given by the truck driver about the biomass supply site and distance form the project.
QA/QC procedures to be applied:	The data on distance of fuel supply site from the plant can be verified by cross checking data records on the distances available with information from other sources (Ex: maps, revenue department or other official sources). Data will be collated annually.
Any comment:	--

B.7.2 Description of the monitoring plan:

>>

This monitoring plan would be developed in accordance with the modalities and procedures for small scale CDM project activities and is proposed for grid-connected electricity generation. The monitoring protocol is to ensure effective monitoring of GHG emissions and accuracy, integrity and security of data. The monitoring plan, which will be implemented by the project proponent describes about the monitoring organization, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving. The monitoring plan makes sufficient provision for monitoring relevant project and baseline emission indicators.

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Personnel	Responsibility
Biomass Procurement Officer	Biomass Procurement Officer is responsible for continuous monitoring of biomass procurement for project activity. He will be responsible for continuous supply of biomass to meet the daily requirement without any shortage. The daily procurement with type of biomass purchased will be maintained in the site.
Shift In charge	Shift in charge will monitor the plant parameters including the monitoring parameters as described in the PDD. He will collect the data recorded in log sheets of respective sections and prepare the consolidated report on electricity generation, export to grid, fuel consumption, plant shut down time, etc. for every shift
Plant Manager	Plant Manager is responsible for the electricity generation of the power plant. He would cross check and sign the daily plant operation reports regularly, and report to General Manager (Operation & Maintenance) for any abnormality. The periodical tests of the monitoring equipments would be looked after by him as per the monitoring plan. The responsibility of storage and archiving of information in good condition also lies with the Plant Manager. He would also co-ordinate to obtain audit reports as per the monitoring plan from Internal auditors.
General Manager (Operation & Maintenance)	General Manager (Operation & Maintenance) will check the generation reports and correct if there is any abnormalities in the power plant. He will also have review meetings periodically with Plant Manager to improve the Plant Performance. He will submit the report to Vice

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	President (Operation & Maintenance)
Sr. Manager (Carbon Portfolio Management)	Sr. Manager (Carbon Portfolio Management) is responsible for the overall CDM activities. He will discuss with plant manager and will be responsible for proper monitoring of data's as mentioned in monitoring plan. He will be reporting to Senior Vice-President (Projects & Sourcing) has to look after the CDM validation / verification process for the project activity.
Vice- President (Operation & Maintenance)	Vice- President (Operation & Maintenance) is responsible for the total monitoring plan. Vice- President will examine the reports generated by Plant Manager / General Manager (Operation & Maintenance) with reference to the monthly electricity generated; net electricity exported to grid. He also examines the internal audit reports prepared by Plant Manager and will in particular take note of any deviations in data over the norms and monitor that the corrective actions have resulted in adherence to standards. He would cross check plant operation reports regularly, and report to Managing Director for any abnormality.
Senior Vice-President (Projects & Sourcing)	Senior Vice - President will coordinate the overall CDM activities and check the final monitoring report. He will cross check the data mentioned in the final monitoring report with the reports generated by Operation & Maintenance team. He will submit the final report to the Managing Director.
Managing Director	Managing Director will review the reports regularly and take necessary corrective action, if necessary.

TNEB personnel: Metering the electricity export to grid and electricity import from grid , is consistently cross verifiable through monthly joint meter reading (JMR) statements which is being endorsed and registered in presence of both; electricity board personnel and the representative from project personnel.

The project activity will reduce GHG emissions through exporting energy to the regional grid resulting in displacement of equivalent generation at grid connected power plants. , Hence, the project proponent is required to monitor and record power exported to the grid, along with a host of other parameters required for calculating project and leakage emissions, if any.

The selected monitoring methodologies requires monitoring of the following parameters

- Types of fuels procured & combusted for the project activity(Ton/y)
- Gross energy generation (kWh/y or MWh/y) by the project activity
- Electricity exportable to grid by the project activity (kWh/y or MWh/y)
- Electricity Imported from the grid system (kWh/y or MWh/y)
- Net calorific values of Fuels(biomass/Coal)(kcal/kg)
- Diesel consumption due to usage of DG set for lighting & emergency purpose etc., (Litre)

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- Average truck capacity for fuel transportation (Ton/y)
- Average round trip distance (for biomass)(km)
- Moisture content of the biomass (%)
- Emission reductions by the Project activity (tCO₂)

However, provision has been kept in the PDD to monitor other biomass usages well, if required under force majeure conditions.

Monitoring Equipments:

- External Metering system which will be located at the grid interface / interconnection serving for billing purpose.
 - Main Meter, for metering the electricity export to grid & import from grid
 - Check Meter, for metering the electricity export to grid & import from grid
- Internal Metering system
 - In house Gross energy generation meter will be installed in plant control room .
- Dip stick for measuring diesel consumption.
- Weighbridge will be installed in plant premises for measuring the outsourced fuel and data will be aggregated at regularly intervals. Project owner takes responsibility for weighbridge operation and maintenance and calibration.

Calibration of Meters:

The Monitoring equipment will be calibrated according to the relevant national/sector standard or regulation or specifications of suppliers. Documents pertaining to testing /calibration of equipment would be maintained.

The in house metering system will be of accuracy class 0.5 be calibrated by the Orient Green Power Company Limited with third party , according to the standard procedures for calibration and supplier's schedule and but at least once in three years .

Both Main meter and Check meter shall be identical in make, technical standards of static type 0.2 accuracy class. The Main meter and Check meter will be calibrated according to the standard procedures. Calibration of meters will be done at appropriate intervals, but atleast once in three years as per SSC-CDM guidelines or whenever any fault occurs to the metering systems.

Weigh Bridge

- The weigh bridge will be calibrated by once in a year by controller of metrology or its registered agency with an accuracy of +/- 5 kg

Day-to-day records handling procedures

Day to day record keeping is done according to a fixed programme indicating what measurements are taken and how the data is processed under the super vision of Shift Incharge.

Quantity:

The quantity and type of fuels delivered to the power plant will be monitored by the weight system that being installed at plant premises. The trucks of fuel from outside are identified by license number, biomass type and will be weighed measured twice, loading weight and empty weight. The information is also archived in the electronic forms . The weight biomass residues of each type will

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be aggregated daily, monthly and yearly in the log books. The fuel delivered in the storage yard will be undergone pre processing if required before feeding in to boiler. Monitoring will be done by the followings:

- Entry record
- Stock record
- Consumption record

Quality:

The quality of the fuels will be monitored to track the calorific value of the fuels. The analysis of fuels will be done in laboratory. The testing will be carried out once annually for the types of fuel utilized. If any in house laboratory be setup the same will be operated and maintained by qualified staff and the measurement from the same can be considered. The records of all analysis will be maintained both in paper and electronic format.

Leakage Monitoring

No leakage is involved in the proposed project activity for the first crediting period .

CDM Internal Audit

CDM internal audits will be carried out by GHG auditors every half-year once.

Emergency Preparedness

Fire hydrants will be provided at important locations in the plant where there might be a situation leading to a fire hazard. Fire extinguishers will also be provided indoors to counter any emergency situations.

Uncertainties and Emergency Preparedness:

Data uncertainties may occur under the following scenarios:

- During error in meter
- When meter is dismantled for O&M or calibration
- When data is not recorded properly or records are lost
- Delay in calibrating the energy meter – In some years, the period between two calibrations may be more than one year due to unavoidable circumstances like unavailability of TNEB personnel or factors which were not under control of the PP

During the above circumstances, the proposed guidance of addressing bias uncertainty (Annex 14 of Meth Panel Meeting 32) can be relied for conservative emission reduction calculations or When the period between two calibrations is more than the indicated frequency of re-calibration, then the measured value for the period shall be adjusted by the accuracy level of the meter.

Provisions for meeting Training

The project is under implementation and if required, the training of the plant personnel and the maintenance of equipments will be imparted by the respective equipment supplier(s) initially at the time of plant commissioning. If needed the training would also take place as and when found necessary by external agency or Consultants and the proper records of the training would be kept. These would need to be verified at the time of verification as the project is under implementation.

Data apportioning

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The apportioning procedure makes use of the daily generation log sheet. However, the daily logs are maintained using the meter readings. Therefore, the apportioning procedure, now described in the monitoring plan, effectively splits the data exclusive portions to be used during the verification periods over the same crediting period. Therefore the use of daily log sheets in fact facilitates the computation of energy generation readings in such situations in a manner that is both accurate as well as reliable. The dates of billing cycle for recording electricity supplied to the grid by utility may not coincide with the starting and ending date of the crediting period for the project activity. In order to overcome the recording mismatch, data apportioning will be performed. During verification it will be ensured that the apportioning used by the Project Participant is correct and reliable and would result in conservative estimate of emission reduction calculations.

Data Recording and Storage

A document control system will be implemented by the plant manager in order to ensure proper storage of the monitored data and other relevant documents.

The plant also establishes Distributed Control systems (DCS). The documents pertaining to monitoring parameters will be preserved for verification of emission reductions from the project, in safe storage. Supporting documents such as Joint meter Reading statements (JMR), receipts of invoices to or payments released by utility will also be preserved in safe storage for later verification. The period of storage will be 2 years after the end of crediting period or the last issuance of CERs for the project activity whichever occurs later.

The monitored data would be presented to the verification agency or DOE to whom verification of emission reductions is assigned.

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

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Date of completion of the baseline: 09/09/2010

Name of the entity determining the baseline: Orient Green Power Company Limited

It is the project entity for the proposed project activity and the details were given in Annex 1.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:
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C.1.1. Starting date of the project activity:
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>>

28/05/2009

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

25 years 0 Months

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C.2 Choice of the crediting period and related information:
C.2.1. Renewable crediting period
C.2.1.1. Starting date of the first crediting period:

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20/10/2011 or from the date of registration.

C.2.1.2. Length of the first crediting period:

>>

7 Years 0 Months

C.2.2. Fixed crediting period:
C.2.2.1. Starting date:

>>

Not Applicable

C.2.2.2. Length:

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Not Applicable

SECTION D. Environmental impacts

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

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As per “Notification on Environmental Impact Assessment of Development Projects” of Ministry of Environment and Forest (MoEF), GOI as amended on 14/09/2006, the Schedule, which lists the projects that require prior environmental clearance, mentions thermal power plants with a capacity \geq 5MW fall under Category B and the respective State Level Expert Appraisal Committee to issue the final EIA report. Further the same was amended in Dec 2009 that the Power projects utilizing biomass with a plant capacity 15 MW are exempted from Environmental clearance . The project being a renewable energy biomass based power project of plant capacity 10 MW, it does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. The order may be accessed at the following location in the MoEF website: <http://moef.nic.in/downloads/rules-and-regulations/3067.pdf>

The project will meet all national and local environmental legislation. The project has obtained the necessary clearance on 09/05/2011 to operate the plant from the pollution control Board, the same is provided to the DOE during the validation.

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:

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The project activity is a renewable energy project. There are no negative environmental impacts envisaged from the project activity

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SECTION E. Stakeholders' comments

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

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Orient Green Power Company Limited the project proponent of 10 MW biomass based power project scheduled the stakeholders meeting at project site on 10/07/2010 to ascertain the stakeholders views in regard of setting up the project . The invitation was published on 29/06/2010 in one English daily and one local language. Besides, invitation letters were also sent to local panchayat and other relevant Government departments. The meeting was held on 10/07/2010 as per scheduled at project site. The meeting was attended by local stakeholders and government officials.

The agenda of the meeting was fixed as follows:

- Welcome
- Description of the project details
- Open discussion
- Vote of thanks

The representative of OGPL welcomed the stakeholders for the meeting & explained them about the project activity, non-conventional energy sources and their importance. The stakeholders were further informed about the benefits of the project activity to the local community. Proceedings of the meeting was recorded and the same is furnished to the DOE.

E.2. Summary of the comments received:

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All the stakeholders who have attended the meeting welcomed the project and there were no negative comments from the stakeholders.

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

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The stakeholder's comments have been considered while preparing the PDD. The project did not receive any adverse comments during the stakeholder consultation and hence no mitigating actions were required . There by the applied process for the local stakeholders consultation is adequate and appropriate .

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Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Orient Green Power Company Limited
Street/P.O.Box:	Door No 18 / 3, Rukmani Lakshmipathi Road (Marshalls Road), Egmore
Building:	4 th floor, Sigappi Achi Building
City:	Chennai
State/Region:	Tamil Nadu
Postfix/ZIP:	600008
Country:	India
Telephone:	+91- 44-49015678
FAX:	+91- 44-49015655
E-Mail:	--
URL:	--
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	P
Middle Name:	Krishna kumar
First Name:	--
Department:	--
Mobile:	+91-98840 89646
Direct FAX:	+91- 44- 49015678
Direct tel:	+91- 44-49015655
Personal E-Mail:	krishnakumar@orientgreenpower.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not Applicable as the project has not received any public funding or Official Development Assistance (ODA).

Annex 3**BASELINE INFORMATION**

<i>Technology / Measure</i>	<i>Project activity</i>
1.) This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to a national or a regional grid. Project activities that displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit shall apply AMS-I.F.	The project activity is a renewable energy generation by utilizing the biomass. and the generated energy will be exported to the primarily fossil fuel fired regional grid .
2.) This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition ¹ ; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is a installation of a new power plant there is no addition of units and there was no renewable energy power plant operating prior to the implementation of the project activity. Hence it is applicable under item (a.)
3.) Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: <ul style="list-style-type: none"> • The project activity is implemented in an existing reservoir with no change in the volume of reservoir, • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m²; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m². 	Not applicable as the project is a biomass based power plant.

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4.) In the case of biomass power plants, no other biomass types than renewable biomass are to be used in the project plant.	The plant envisages the biomass fuels for generation of energy and the biomass is of renewable biomass ³³
5.) If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.	The power plant is a new installation ie Green field activity has co firing facility for fossil fuel with a plant capacity of 10 MW and renewable component of the unit does not exceed 15MW threshold for small-scale CDM projects. The project activity envisages the use of a fuel mix of renewable biomass and coal (85:15) ³⁴ to be combusted in the project activity .
6.) Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable as the project is not a co-generation unit.
7.) In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	The project activity is a greenfield project and there are no existing power generation units at the facility.
8.) In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the s retrofitted or replacement unit shall not exceed the limit of 15 MW.	The project activity is new installation This criterion is not applicable.

³³ *The envisaged fuels are coconut residues, prosopis juliflora, saw dust\,s, sugar cane trash per the biomass assessment carried out in the project region and condition 4 & 5 of Definition of renewable biomass EB 23 Annex 18, applies to the biomass envisaged as per CDM glossary for Renewable biomass and thus the meets the definition of renewable biomass.*

³⁴ The use of coal cannot be exceeded beyond 15% in accordance with the statutory approvals received for the Project activity

Annex 4

MONITORING INFORMATION

The details are furnished in Sec B.7 of this document
