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2CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

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

SECTION A. General description of small-scale project activity

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

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Biomass based power project of Rayapati Power Generation Private Limited
Version 02
06/02/2008

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

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Purpose

The purpose of the project activity is to install a biomass based power plant of capacity 7.5 MW in Rajnandgaon in the State of Chhattisgarh to produce environmental friendly green power using the biomass available in the region.

The plant will operate with Rice husk as the main fuel. A detailed study of the biomass availability has been undertaken which indicated ample availability of biomass for uninterrupted operation of the plant.

The power generation scheme involves installation of One No.(1) 35TPH Nominal capacity Boiler with the superheater outlet steam parameters of 67 ata and 480 Deg C and One No. (1) extraction cum condensing turbogenerator of 7.5 MW nominal capacity, operating with the steam inlet parameters of 64 ata and 480 deg C. The boiler and the turbogenerator will be installed with all the necessary auxiliary plants and system required for the efficient operation of the biomass based power generation. The plant is expected to generate 53.4 Million KWh to the Chhattisgarh State Electricity Board (CSEB) grid on an annual basis.

Contribution to Sustainable Development

- The project activity will lead to generation of employment opportunities for the local population.
- The project activity will aid in infrastructural development of the region thus resulting in promotion of industries in the area
- As the availability of job opportunities is expected to rise in the rural areas, it will lead to reduced migration of the rural population to urban areas.
- The project will create business opportunities for local stakeholders such as bankers, suppliers, manufacturers, contractors *etc.*

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- The project activity will help in reducing the SOx, NOx and other emissions arising due to the combustion of fossil fuels in thermal power plants.
- The project activity will help in conservation of non-renewable fossil fuels and the consequently help in mitigating GHG emissions.

In view of the above the project participant considers that the project activity contributes to sustainable development.

A.3. Project participants:

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Name of 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	Rayapati Power Generation Private Limited (Private entity. Project developer.)	No

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

The proposed power plant will generate an aggregate gross power output of 53.46 Million KWh on an annual basis. The power thus generated, after meeting the complete internal auxiliary requirements would be exported to the State Electricity Board grid. The plant will have one (1) No. of 35 TPH capacity AFBC boiler with the outlet steam parameters at 67 ata and 485 deg C, one (1) Single extraction cum condensing turbo-generator of 7.5 MW nominal capacity.

All steam based power plants operate under the Rankine Cycle. However, the steam cycle adopted for the plant is a modified Rankine cycle with Regenerative feed water heating. To improve the efficiency of the cycle the feed water from the condenser is heated with the steam extracted from the turbine.

The steam parameters at the outlet of the boiler superheater will be 67 ata and 485 deg C. The turbine throttle valve inlet pressure and temperature will be 64 ata and 480 deg C and the difference in the parameters between the boiler outlet and the turbine throttle valve inlet take care of the pressure and the temperature losses in the piping.

In addition to the main power generating equipment, the plant will be complete with all the necessary auxiliary facilities such as fuel storage and handling system, condensate and feed water system, compressed air system, cooling water system, ash handling system, fire protection system and electrical system including power evacuation facilities etc.,

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

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The project activity is located in Thakurtola village, Rajnandgaon District, Chhattisgarh State of India.

A.4.1.1. Host Party(ies):

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India

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

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Chhattisgarh

A.4.1.3. City/Town/Community etc:

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Rajnandgaon

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

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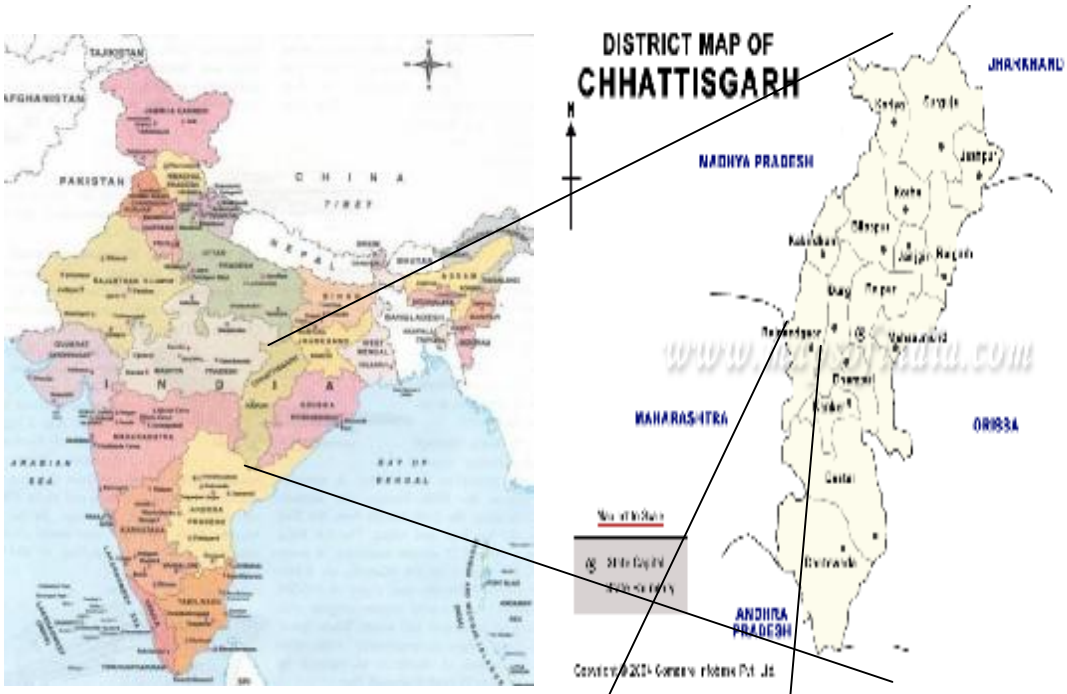
The plant is located in the village Thakurtola in district Rajnandgaon of Chhattisgarh state, India.
The latitude and longitude of the site are N 21°5 and E 81°2



Site Location

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

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Project Type: Type (i) Renewable Energy Project (Small Scale)

Category: Grid Connected Renewable Electricity Generation

Technology/Measure: Biomass based renewable energy generation unit supplying electricity to and/or displaces electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.

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

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Years (July to June)	Annual estimation of emission reductions in tonnes of CO_2e
2008 – 2009	28965
2009 – 2010	28965
2010 – 2011	28965
2011 – 2012	28965
2012 – 2013	28965
2013 – 2014	28965
2014 – 2015	28965
2015 – 2016	28965
2016 – 2017	28965
2017- 2018	28965
Total estimated reductions (tones of CO2e)	289650
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	28965

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

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No public funding is available to the project. Project is implemented with equity of project proponent (RPGPL) and long term debt by IREDA.

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

According to Appendix C of Simplified Modalities & Procedures for small scale CDM project activities, 'Debundling' is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities. A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small- scale activity at the closest point.

In RPGPL's case, it does not fall under the debundled category and qualifies as a small scale CDM project. It is the single such project of the promoters. The conditions in paragraph 2 of Appendix C confirm that the proposed small-scale project activity is not a debundled component of a larger project activity.

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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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The small scale methodology applicable to the project activity is Type I – Renewable Energy Projects subset D - Grid connected renewable electricity generation

AMS I.D (Version 13)

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

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As per Clause 2 of Type I.D of Appendix B of **simplified modalities and procedures for small-scale CDM project activities (Version 13),** in case of units which co-fire non renewable biomass or fossil fuel the capacity of the entire unit shall not exceed the limit of 15 MW, for the project to qualify as a small-scale CDM project.

The project activity is a 7.5 MW Biomass based Power project which is less than the specified limit of 15 MW for Small scale Project activities. The project proposes to generate power using renewable biomass as fuel and will be exporting it to the Chhattisgarh State Electricity grid. Hence the small scale methodology applicable to the project activity is Type-I Renewable Energy Projects Subset D – Grid Connected renewable electricity generation.

B.3. Description of the project boundary:

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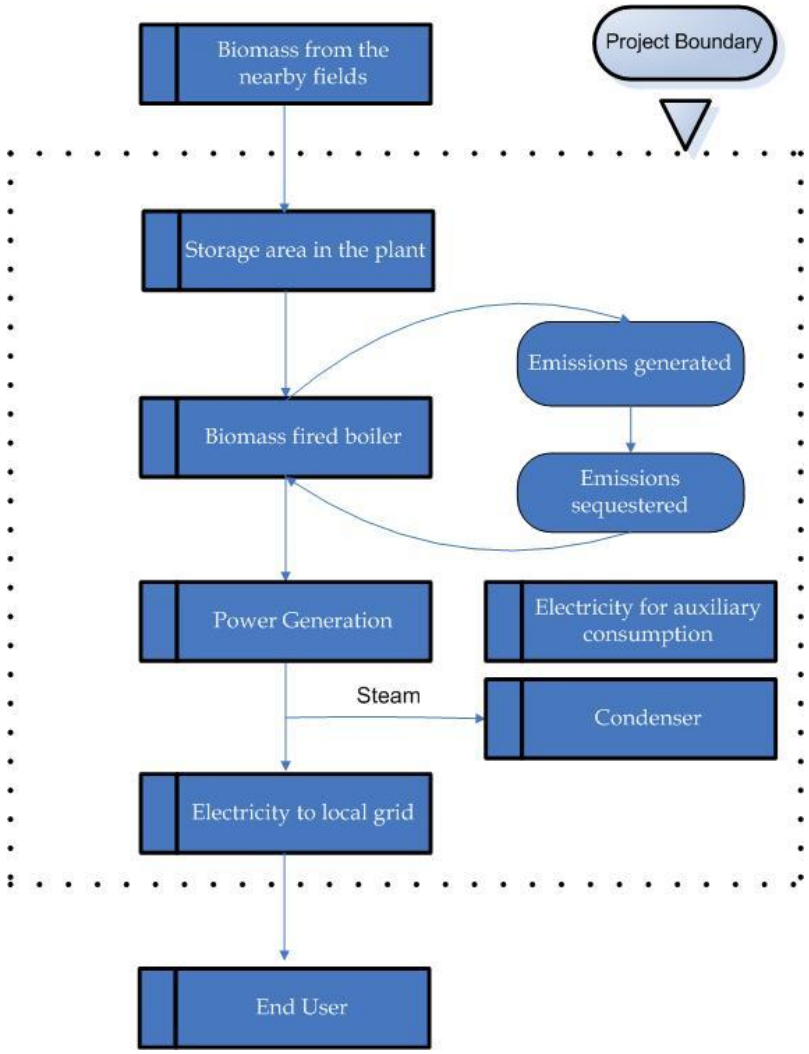
As per the guidelines mentioned in Type I. D. of Annex B of the simplified modalities and procedures for small-scale CDM project activities, project boundary encompasses the physical and geographical site of the renewable generation source.

Hence, the project boundary covers the point of fuel supply to the point of power export to the grid where the project proponent has a full control. Hence, project boundary is considered within these terminal points. As the plant uses only biomass residues the area where the biomass is extracted or produced is not included in the boundary.

Thus, boundary covers fuel storage and processing, boiler, Steam Turbine Generator (STG) and all other power generating equipments, auxiliary consumption units.



B.4. Description of baseline and its development:

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The baseline methodology has followed the one specified under Project category I.D in Appendix B of the Simplified M&P for small scale CDM project activities.

As the project activity involves generation of power using biomass and supplying the power to the grid, the "*Tool to calculate the emission factor for an electricity system*" has been used for determination of the baseline. The latest version of the said tool, Version 01, has been used for the calculation.

Calculation of the Baseline Emission Factor

Step 1: Identifying the relevant electric power system

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A "project electricity system" is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

A "connected electricity system" is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint. The tool requires the following considerations while determining whether significant transmission constraints exist or not:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.

- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

In the Indian context, as no well established spot markets exist, the first criterion is not applicable. Similarly, a transmission line fulfilling the second criteria is an exception in Indian Context. Hence the use of these criteria does not result in a clear grid boundary. In such a scenario, the use of a regional grid definition in case of large countries with layered dispatch systems (e.g. provincial, regional/national) is recommended. Further, it states that a provincial grid definition may in many cases be too narrow given significant electricity trade among provinces that might be affected, directly or indirectly, by a CDM project activity.

The Indian power system is divided into five independent regional grids, namely Northern, Eastern, Western, Southern and North-Eastern. Each grid covers several states. The state of Chhattisgarh is covered under the Western grid where the project activity is located.

Each state in a regional grid meets its own demand with its own generation facilities and also with allocation from power plants owned by the central sector. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The volume of the net transfers between the regions in India is relatively small and electricity is largely produced and consumed within the same states. Consequently, it is appropriate to assume that the impacts of the project activity will be confined to the regional gird in which it is located. Hence for the purpose of estimation of the baseline emission factor, the Western Regional grid has been chosen as the relevant electricity system.

Step 2: Selection of an Operating Margin method

The project proponent wishes to use the Simple Operating Margin (OM) method for the estimation of the baseline. The use of the Simple OM method is justified as the share of the low cost/ run resources constitute less than 50% of the total grid generation. The Ex ante option has been chosen where in a three year generation weighted average based on the most recent data would be calculated ex ante and would be fixed for the entire crediting period. Hence, the parameters for the calculation of OM do not need to be monitored and the OM does not need to be calculated during the chosen crediting period of ten years. .

Step 3: Calculation of the OM according to the Simple OM method

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The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.
The data provided by the Central Electricity Authority (CEA), an official data source has been relied upon for the calculation of the OM[1]. The same has been detailed in Annex 3. The latest version of the database, Version 3 has been used. The OM calculations have been based upon generation data, fuel consumption and the Gross Calorific value (GCV) of the fuel.

Assumptions

The following assumptions have been made in case of unavailability of data at station level:

Net generation: In case of stations where only gross generation data is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation.

GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

The following assumptions have been in case of unavailability of data at unit level:

Net generation: The data is not monitored at a unit level and hence the following assumptions have been made

1. The auxiliary consumption (in % of gross generation) of the unit was assumed to be equal to that of the respective stations in the following cases:
   - All units of a station fall into the build margin; or
   - All units of a station have the same installed capacity; or
   - The units in the station have different capacities but do not differ with respect the applicable standard auxiliary consumption.
2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.

Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO_2 emissions of the relevant units were directly calculated based on heat rates.

Calculation Approach

The Simple OM has been calculated using the following formula:

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where:
$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

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

$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power plant / unit m in year y (mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)

$EG_{m,y}$ = Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)

m = All power plants / units serving the grid in year y except low-cost / must-run power plants / units

i = All fossil fuel types combusted in power plant / unit m in year y

y = The three most recent years for which data is available at the time of submission of the PDD to the DOE for validation (for ex ante option)

The Operating Margin thus calculated is 1.0

$$OM = 1.0$$

Step 4: Identification of the cohort of power units to be included in the Build Margin

The sample group of power units m selected for calculation of the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The data pertaining to the units thus identified are detailed in the Version 3 of the Baseline Carbon Dioxide Emissions database of the CEA[2].

With regards to data vintage, the project participant wishes to use Option 1 viz., For the crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation.

Step 5: Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

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

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$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The Build Margin would be fixed ex ante during the crediting period and does not require to be monitored.

Therefore,

BM = 0.59

Step 6: Calculation of the combined Build Margin

The combined margin will be calculated as follows:

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

Where,

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

The default values to be used for Biomass based Power projects are

w_{OM}= 0.5 w_{BM}= 0.5

Hence, the Baseline Emission Factor is calculated as below:

EF = w_{OM} * OM + w_{BM} * BM

= 0.5 * 1.00 + 0.5 * 0.59

= 0.79 $kgCO_2$/KWh

The Baseline Factor of 0.79 $kgCO_2$/KWh thus calculated has been fixed for the entire crediting period.

Baseline Emission Calculation

RPGPL expects to export 37.74 Million KWh on annual basis to the state grid. The same has been arrived based on the procedures laid out in Paragraphs 13 to 18 of the approved methodology AMS ID (Version 13) and have been further detailed in Section B.6.

Hence, the Baseline Emissions is calculated as below:

Baseline Emissions = 37.74 * 0.79 /1000 = 29810 tonnes of CO_2

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

The project activity meets the eligibility criteria to use simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7.

As per the decision 17/cp.7 Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

Further referring to Appendix A to Annex B document of indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, project participants shall provide a qualitative explanation to show that the project activity would not have occurred anyway, at least one of the listed elements should be identified in concrete terms to show that the activity is either beyond the regulatory and policy requirement or improves compliance to the requirement by removing barrier(s) ;

Barriers due to prevailing practice:

Of the total power generation in Chhattisgarh, 85% is generated from coal based thermal power plants, which is indicative of the vast reserves of coal available in Chhattisgarh. 16% of the coal reserves estimated in India are in Chhattisgarh. At present, power generation with Biomass as a fuel, is not a common prevailing practice in India and in Chhattisgarh. In 2005-06, in Chhattisgarh, of the installed capacity of 1415.8 MW, 1280 MW was coal based and the remaining 130 MW was generated through hydel power[3]. As on 11/11/2005, there were only two biomass based power plants operational in the state of Chhattisgarh, viz., M/s Vandana and M/s Indo Lahiri.

This is indicative of the low penetration of biomass based power projects in the region and little willingness of entrepreneurs to change the current operating practices in the region. We may conclude from the above that the proposed project under discussion is not a common practice in the region. The practice of generating power by using biomass as primary fuel had not penetrated in the region. The analysis on the common practices adopted for power generation in Chhattisgarh further justifies that the project is not a part of the baseline.

This primarily has been due to the low returns in such project activities. The project proponent could have refrained from setting up the power project and the existing practice of setting up coal based power plants would have continued resulting in higher GHG emissions. However, the availability of CDM funds would have helped the project proponent in improving the returns and exceeding the standard benchmark for similar project activities. Hence, the project proponent decided to proceed ahead with the implementation of the project activity.

Financial Barrier

Returns from biomass based power projects are sensitive to fuel prices as they form a major part of the cost of power generation. Tariff prices for biomass based power plants are decided taking into consideration the prevailing prices and a year on year escalation. The CSERC in its order passed on the

[3] http://cseb.gov.in/generation.htm

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11th of November 2005 had taken into consideration a landing price of Rs. 800 per MT for biomass with a year on year escalation of 5% for calculation of the tariff.

However, biomass based power plants not being a common practice in the state of Chhattisgarh, the consumption of biomass was low and the surplus biomass generated then remained unutilized. Consequently, the price for biomass was low and transportation charges formed a major part of the landing price. However, high escalation of the fuel prices was expected after the commissioning of the power plant primarily because a) a demand is created for the surplus biomass which otherwise was being unutilized b) the exit barrier for project proponents becomes high after the setting up of the plant with an investment of around INR 40 Million INR per MW. The biomass suppliers are hence able to charge higher prices after the setting up of the plant resulting in high escalation. Similar escalation had already been witnessed in the state of Andhra Pradesh and the project proponent faced similar risk in setting up the biomass based power plant in the state of Chhattisgarh as well.

At the time of tariff fixation for biomass based power plants, the price of biomass varied between Rs. 800 to 1000 per MT. Chhattisgarh Renewable Energy Development Agency (CREDA), the state nodal agency had recommended a price slab of around INR 800 to 900 for the purpose of tariff fixation. However, the tariff setting was done assuming the price at the lower end, i.e. of Rs. 800 per MT which adversely affected the project activity. The escalation for the biomass price was also fixed at 5%. There was also the possible risk of further price escalation in excess of 5% after the setting up of the plant as had been witnessed in the other states in the country.

Based on the set of assumptions detailed in Appendix E the net present value expected from the future cash flows was estimated to be INR -37.7Million. The discounting factor assumed for the calculation was 16%, the benchmark return on equity recommended by the Chhattisgarh State Electricity Regulatory Commission for biomass based power projects.

RPGPL took into account the estimated return from biomass based power projects. The project activity is expected to generate an average of around 28965 CERs on an annual basis. Assuming a conservative CER price of Euro 10, the NPV of the cash flow increases to INR 36.4Million. The revenue from CDM funds would have helped the project participant in hedging the increase in the fuel prices as well. Hence, RPGPL decided to proceed ahead with the implementation of the project activity.

Investment Barrier

Chhattisgarh has relatively low level of industrialization in the state and has limited infrastructure[4]. This has acted as an impediment for its growth and consequently, Chhattisgarh is low on natural perception, and also ranks low on development indicators along with the perceived potential for development. There is an absence of a divergent industrial base in Chhattisgarh and current availability of skilled labour is further restricted to select industries. In spite of the above, the project proponent has decided to set up a biomass based power plant in the region which is expected to aid in Chhattisgarh's industrial development and particularly in the household electrification of the villages located near the project site.

Also, the state of Chhattisgarh was yet to undertake measures that would encourage private sector participation in the power sector. The Chhattisgarh State Electricity Regulation Commission (CSERC) in

[4] http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN011830.pdf#search=%22embarking%20on%20a%20Visioning%20exercise%20it%20is%20important%22

its tariff order, passed on the 15th of June 2005[5], observed that the operational systems of the board were still those inherited from the erstwhile Madhya Pradesh Electricity Board (MPEB) and significant initiatives for structural reforms and improvement of the operational system were not being taken by the board as envisaged under the Electricity Act, 2003.

Though other progressive states in the country had implemented forward looking policies and offered a better investment climate for the private sector participation in the power sector, the project proponent decided to proceed ahead with setting up of the power project in Chhattisgarh which would result in utilization of the biomass generated in the state. In case the project proponent had decided against setting up of the facility, the state's potential to generate biomass based power would have been under utilized.

Other Barriers

Human component: The promoters of RPGPL have ventured in to the biomass based power business for the first time. There may be problems associated with the technical know-how of the power plant operation, coping up with the changes in the power policies/subsidies etc., which may cause some problems associated with the operation of the plant in efficient and profitable manner.

Information component: Being a new entrants in to the field of power generation, there could be knowledge gap always in the areas of practices of commercial power generation and export, operation of power plant at varying grid conditions, solving unexpected technical snags and decision making etc., Inability to solve technical problems in time and uncertainty in taking vital and important decisions with regards to the operation of the plant may possibly result in high costs and consequently heavy losses.

This discussion suggests that there are barriers to the proposed project activity, which can be mitigated to certain[6] extent from CDM benefit.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Baseline

The Baseline Emissions Factor, calculated as per the procedures laid out in the *'Tool to calculate the Emission Factor for an Electricity System',* works out to 0.79 $kgCO_2$/ KWh

The procedures followed, the choices made, the assumptions made and the source of data used for the calculation of the Baseline Emission Factor is detailed in Section B.4

Baseline Emission Calculation

The methodology AMS I.D (Version 13), requires ex ante specification of the following parameters:

[5] http://chhattisgarhserc.org/pdf/Determination_of_Annual_Revenue_Requirement__ARR__and_Retail_Supply_Tariff_FY_2005-06.pdf

[6] Uncertainty related to carbon market and cash flows is also a deterrent.

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- Specific fuel consumption for all types of biomass to be consumed in the power plant.
- Specific fuel consumption for all types of fossil fuels to be consumed in the power plant.

Further, Paragraph 16 of the methodology states that if fossil fuel is used the electricity generation metered should be adjusted to deduct electricity generation from fossil fuels using the specific fuel consumption and the quantity of fossil fuel consumed.

Also, the amount of electricity generated using biomass fuels calculated as per paragraph 16 shall be compared with the amount of electricity generated calculated using specific fuel consumption and amount of each type of biomass fuel used. The lower of the two values should be used to calculate emission reductions.

RPGPL expects to generate 53.46 Million KWh on an annual basis. The biomass assessment study conduct in the region revealed ample rice husk availability for sustained operation of the power plant. Hence RPGPL expects to consume only rice husk for the operation of the plant.

RPGPL is also permitted to use Coal up to an extent of 25% of the total weight of fuel consumed. Although, the expected coal consumption is not high, for ex ante calculations, it has been assumed that RPGPL would consume 15,000 tonnes of F grade coal.

The Station Heat Rate (SHR) of 4047 kcal/KWh has been specified as the average SHR for biomass based power plants and the same has been used for the estimation of the tariff by Chhattisgarh State Electricity Regulatory Commission.

SHR = 4047 kcal/KWh

Where,
SHR is the station heat rate in kcal/KWh.

The net calorific value of the rice husk available in the region is around 3300 kcal/kg. The F grade coal procured for consumption in the plant has a net calorific value of around 2800 kcal/kg.

NCV_{Coal} = 2800 kcal/kg.
$NCV_{Rice\ Husk}$ = 3300 kcal/kg

Hence, the specific fuel consumption of rice husk is:

$SFC_{Rice\ Husk}$ = SHR/ NCV = 4047 / 3300 = 1.226 kg/KWh.

Also, the specific fuel consumption of coal is:

SFC_{Coal} = SHR/NCV = 4047/ 2800 = 1.445 kg/KWh.

Where,
SFC_{Coal} is the Specific Fuel consumption for coal in kg/ KWh
$SFC_{Rice\ Husk}$ is the Specific Fuel for Rice husk in kg /KWh

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Assuming the annual coal consumption as 15,000 tonnes, the power generated using biomass is calculated as below:

Q_{Coal} = 15,000 tonnes

E_{Gen} = 53.46 Million KWh.

$E_{Gen,coal}$ = Q_{Coal} x 1000 /SFC_{coal}

$$= \frac{15000 \times 1000}{1.445}$$

= 10.38 Million KWh

$E_{Gen,Biomass}$ = 53.46- 10.38
= 43.08 Million KWh ……..……..……(a)

Where,
E_{Gen} is the amount of power generated during the year in KWh.
$E_{Gen, Coal}$ is the amount of power generated using coal during the year in KWh.
$E_{Gen, Biomass}$ is the amount of power generated using biomass during the year in KWh.
Q_{Coal} is the Quantity of coal consumed during the year y in tonnes.

With the assumed consumption of coal being 15,000 tonnes, the expected rice husk consumption, is 52,834 tonnes.

Therefore,

$Q_{Rice\ Husk}$ = 52,834 Tonnes

Where,
$Q_{Rice\ Husk}$ is the Quantity of rice husk consumed during the year y in tonnes.

Hence, $E_{Cal\ Rice\ Husk}$ = $Q_{Rice\ Husk}$ x 1000 / $SFC_{Rice\ Husk}$

$$= \frac{52834 \times 1000}{1.226}$$

= 43.08 Million KWh

Where,
$E_{Cal,\ Rice\ husk}$ is the amount of power generated using Rice husk and calculated as per the procedures laid down in paragraph 18 of AMS ID (Version 13)

As Rice Husk is the only fuel expected to be used during the crediting period, the power generated using biomass is equal to the power generated using rice husk.

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Therefore,

$E_{Cal, Biomass} = E_{Cal, Rice Husk} = 43.08$ Million KWh. ……..……..(b)

Where,
$E_{Cal, Rice husk}$ is the amount of power generated using Rice husk and calculated as per the procedures laid down in paragraph 18 of AMS ID (Version 13)

As per the methodology, the lower of the two figures, $E_{Gen, Biomass}$ (a) and $E_{Cal, Biomass}$ (b) as calculated above is to be used for the calculation of Emission Reduction.

Therefore, for the purpose of Emission Reduction calculations, the power generated using biomass is 43.08 Million KWh.

E_Y = Min ($E_{Gen, Biomass}$ and $E_{Cal, Biomass}$) = 43.08 Million KWh.

Where E_Y is the quantity of electricity used for the calculation of Emission Reduction in KWh.

The auxiliary consumption for the power plant is expected to be around 10% of the total power generated and the same has been used for Ex Ante calculation of Emission Reduction. Hence Auxiliary consumption (E_{Aux}) is calculated as shown below:

$E_{Aux} = 53.46 * 0.1 = 5.35$ Million KWh.

However, during the crediting period, the E_{Aux} would be determined as below:

$E_{Aux} = E_{Gen} - E_{Exp}$

Where,
E_{Aux} is the Amount of Auxiliary power consumption in KWh.
E_{Gen} is Total amount of Power Generated in KWh.
E_{Exp} is Total amount of Power Exported to the Grid in KWh.

Therefore, the power exported to the grid using biomass is

$E_{Exp, Biomass} = E_Y - E_{Aux}$
$= 43.08 – 5.35 = 37.73$ Million KWh.

Where, $E_{Exp, Biomass}$ is the quantity of electricity generated using biomass and exported to the grid in KWh.

The Baseline Emissions is hence calculated as

BE $= EF \times E_{Exp, Biomass} \times 1000$
$= 0.79 \times 37.73 \times 1000$
$= 29810$ tonnes.

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Where,
BE is the baseline emissions during the year y in tonnes of CO_2

The baseline emissions, thus calculated Ex Ante work out 29, 810 tonnes.

Project Emissions

RPGPL would import power from the grid for startup basis and during exigencies. The power imported from the grid would be monitored using meters and the project emissions on account of such imports would be calculated using the following formula:

$PE_{imp} = EF \times E_{imp} \times 1000$

Where,
PE_{imp} = Project Emissions due to the import of power in tones of CO_2
E_{imp} = Electricity imported from the grid in Million KWh.

For Ex ante calculations, the power import has been assumed to be 2% of the total power exported to be generated.

Hence, E_{imp} = 1.07 Million KWh.
PE_{imp} = 1.07 x 0.79 x 1000
= 845 tonnes of CO_2

Leakage

Leakage due to transportation of biomass

The leakage activity identified, which contributes for GHG emissions outside the project boundary is transportation of biomass from biomass collection centers to biomass power project site. Calculation of leakage has been carried-out as under:

Parameter	Value
Maximum Quantity of Biomass that may be procured	65,000 MT
Average Distance between project site and biomass collection centers	75
Biomass load per truck	10 MT
Number of return trips	6500
Consumption of Diesel per trip (4km/litre)	18.75 Litres
Total Diesel consumption	243750 Litres pa
CO_2 emission factor for Diesel (as per IPCC guidelines)	74.10 tons CO_2 / TJ
CO_2 emission per annum	646 tCO_2

As per the general guidance on leakage in biomass projects, for small scale energy CDM project activities involving renewable biomass, there are three types of emission sources that are potentially significant (>10% of emission reductions) and attributable to the project activities. These emission sources may be project emissions (if under the control of project participants, i.e. if the land area where the biomass is grown is included in the project boundary) or sources of leakage (if the source is not under control of

project participants). The following table summarises for different types of biomass, the cases where the emission source is relevant and the cases where it is not.

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**

For the project activity, the following are considered to calculate the possible emissions due to leakage:

1. As the project activity will use only biomass residues, the implementation of activity will not lead to shift of pre project activities.
2. The biomass that will be used in the plant is generated from various crops. This waste will anyhow be generated even in the absence of the project activity and would be burnt without being used for any other purpose. Hence there are no emissions from the production of renewable biomass due to application of fertilizer and from clearance of lands.
3. There is sufficient biomass available in the region and the same is revealed in Biomass assessment reports by M/s S.R.Corporate Consultant (P) Ltd, Raipur. The availability of surplus rice husk alone in the area is around 2.04 lakh tones per annum which is much higher than the maximum estimated quantity of 65000 tonnes expected to be procured for the operation of the power plant. This indicates the abundant availability of the biomass in the region. The quantity of biomass that is available in the region is more than the quantity of biomass that is utilized including the project activity and hence the leakage can be neglected.

From the above analysis, it can be concluded that the project activity does not have any sources of leakage due to type of biomass utilised.

Hence EL= 0.

Annual Leakage Assessment

Biomass assessment in the region will be carried out annually based on the latest available literature / data from the government sources to determine if the biomass is at least 25% larger than the total quantity utilized by the project activity as well as existing users. In the absence of the official data, a biomass assessment study will be carried out by employing third party assessors who have past experience of doing similar work.

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$LQ_{Biomass} = [TQ_{Biomass} - (BQ_{project} + BQ_{other\ users})*1.25]$ ……(1)

$LQ_{Biomass}$ = Quantity of Biomass less than the required 25% larger than combined usage (in Kg)
$TQ_{Biomass}$ = Total Biomass Quantity available in the region in Kg
$BQ_{project}$ = Biomass Quantity utilized by project activity in Kg
$BQ_{others\ users}$ = Biomass Quantity utilized by other users in Kg

In case $LQ_{Biomass}$ is positive (+) then there would be no leakage, hence Leakage (L) will be zero. However, if LQ Biomass is negative (-), then the leakage would be due to the use of equivalent amount of coal in the region and the same shall be calculated using the following formulae:

In order to estimate the leakage caused due to the project activity, the lower of the following two values would be used.

1) Abs ($LQ_{biomass}$)
2) $BQ_{project}$

LQ_{short} = Lower of Abs ($LQ_{biomass}$) and $BQ_{project}$

$L = \{[-(LQ_{short}) \times NCV_{Biomass}]\} \times EF_{Coal}$ ……(2)

L = Leakage (tCO_2)
LQ_{short} = Quantity of Biomass less than the required 25% larger than combined usage (in Kg)
$NCV_{Biomass}$ = Net Calorific Value of Biomass (in TJ/Kg)
EF_{Coal} = Emission Factor of Coal (IPCC Default, tCO_2/TJ)

Emission Reduction

ER = BE-PE-EL

Where

ER	Emission reduction by project activity during the year y.
BE	Baseline Emissions during the year y.
PE	Project Emissions during the year y.
E	Leakage during the year y.
EL	Emission leakage (tonnes/year) (= 0)

As calculated using the procedures described above,

Baselime Emissions = 29810 Tonnes of CO_2
Project Emissions = 845 Tonnes of CO_2
Leakage = 0 Tonnes of CO_2

Therefore,

ER = 29810 – 845 – 0 Tonnes of CO_2
= 28965 Tonnes of CO_2

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

Data / Parameter:	EF
Data unit:	tCO_2/KWh
Description:	Baseline Emission Factor
Source of data used:	Central Electricity Authority, Ministry of Power
Value applied:	0.79
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official source of data has been used for the estimation of the CER.
Any comment:	The Baseline Emission Factor has been fixed for the entire crediting period.

Data / Parameter:	SFC_{coal}
Data unit:	tCO_2/KWh
Description:	Specific Fuel Consumption for Coal
Source of data used:	CSERC Tariff Order & RPGPL Records.
Value applied:	1.445
Justification of the choice of data or description of measurement methods and procedures actually applied :	The parameter has been calculated based on the SHR and the Net Calorific Value of Coal. Official source of data has been used for the estimation of the Station Heat Rate. The Calorific value of the F-grade coal available in the region has been based on the in house laboratory test results.
Any comment:	The parameter is calculated based on the Station Heat Rate and the Net Calorific Value of the coal available in the region.

Data / Parameter:	$SFC_{Rice\ Husk}$
Data unit:	tCO_2/KWh
Description:	Specific Fuel Consumption for Rice Husk
Source of data used:	CSERC Tariff Order & RPGPL Records.
Value applied:	1.226
Justification of the choice of data or description of measurement methods and procedures actually applied :	The parameter has been calculated based on the SHR and the Net Calorific Value of Rice husk available in the region. Official source of data has been used for the estimation of the Station Heat Rate. The Calorific value of the rice husk has been arrived at through in house laboratory tests.
Any comment:	The parameter is calculated based on the Station Heat Rate and the Net Calorific Value of the rice husk available in the region.

B.6.3 Ex-ante calculation of emission reductions:

>>

Based on the methodology and formulas detailed in the above section, the Carbon Emission Reductions have been calculated and are provided in Appendix C.

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

>>

	Operating Years	Leakage (tones of CO_2)	Baseline Emissions (tonnes of CO_2)	Project Emissions (tonnes of CO_2)	Emission Reductions (tonnes of CO_2)
1.	2008-2009	0	29810	845	28965
2	2009-2010	0	29810	845	28965
3	2010-2011	0	29810	845	28965
4	2011-2012	0	29810	845	28965
5.	2012-2013	0	29810	845	28965
6.	2013-2014	0	29810	845	28965
7.	2014-2015	0	29810	845	28965
8.	2015-2016	0	29810	845	28965
9.	2016-2017	0	29810	845	28965
10.	2017-2018	0	29810	845	28965
	Total	0	298100	8450	289650

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	E_{Exp}
Data unit:	KWh
Description:	Power exported to the grid by the power plant during the crediting period.
Source of data to be used:	Monthly billing records of the Chhattisgarh State Electricity Board for the electricity supplied to the grid.
Value of data	48.11 Million KWh
Description of measurement methods and procedures to be applied:	Power exported will be measured using electricity meters.
QA/QC procedures to be applied:	Detailed in Annex 4.
Any comment:	The data would be archived for a period of two years.

Data / Parameter:	E_{Imp}
Data unit:	KWh
Description:	Power imported from the grid by the power plant for start up purpose/during emergency during the year y.

Source of data to be used:	Monthly billing records of the Chhattisgarh State Electricity Board for the electricity imported from the grid.
Value of data	1.07 Million
Description of measurement methods and procedures to be applied:	The power imported from the grid would be measured using electricity meters.
QA/QC procedures to be applied:	Detailed in Annex 4.
Any comment:	The data would be archived for the Crediting Period + 2 years.

Data / Parameter:	E_{Gen}
Data unit:	KWh
Description:	Power generated by the plant.
Source of data to be used:	Meters to be installed at the plant site of RPGPL.
Value of data	53.46 Million KWh per annum
Description of measurement methods and procedures to be applied:	The power generated will be measured using electricity meters.
QA/QC procedures to be applied:	Detailed in Annex 4.
Any comment:	The data would be archived for crediting period + 2 years.

Data / Parameter:	$Q_{Rice\ Husk}$
Data unit:	MT
Description:	The quantity of the rice husk consumed during the year y.
Source of data to be used:	RPGPL records.
Value of data	52834
Description of measurement methods and procedures to be applied:	The rice husk on receipt in the Plant will be measured by weighing it on the Electronic Weigh Bridge installed in the Plant and unloaded in the fuel storage yard. Shift wise consumption of rice husk can be estimated by monitoring the rate of the variable feed drives of the biomass feeders.
QA/QC procedures to be applied:	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The measuring equipments will be calibrated as per the standards on an annual basis.
Any comment:	The data would be archived for Crediting Period + 2years.

Data / Parameter:	Q_{Coal}
Data unit:	MT
Description:	The quantity of the coal that may be used in the plant during the crediting period.
Source of data to be	RPGPL Records

used:	
Value of data	15000
Description of measurement methods and procedures to be applied:	Coal on receipt in the Plant will be measured by weighing it on the Electronic Weigh Bridge installed in the Plant and unloaded in the fuel storage yard. Shift wise consumption of coal can be estimated by monitoring the rate of the variable feed drives of the coal feeders.
QA/QC procedures to be applied:	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The measuring equipments will be calibrated as per the standards on an annual basis.
Any comment:	RPGPL is permitted to use 25% coal by weight. For Ex ante calculations, the amount of coal consumption has been assumed as 15000 tonnes. The data would be archived for Crediting period + 2 years.

Data / Parameter:	Calorific Value of Rice husk
Data unit:	Kcal/Kg
Description:	Calorific Value of rice husk to be used in the power plant during the crediting period.
Source of data to be used:	RPGPL Records
Value of data	3300
Description of measurement methods and procedures to be applied:	The calorific value of rice husk would be monitored on a monthly basis at the in-house laboratory at RPGPL plant site. In case different sources of fuel are used, weekly testing would be undertaken.
QA/QC procedures to be applied:	Detailed in Annex-4
Any comment:	The data would be archived for the Crediting Period + 2 years.

Data / Parameter:	Calorific value of coal
Data unit:	Kcal/kg
Description:	Calorific Value of the coal that may be used in the power plant during the crediting period.
Source of data to be used:	RPGPL Records
Value of data	2800
Description of measurement methods and procedures to be applied:	The calorific value of coal would be monitored on a batch wise basis at RPGPL's laboratory
QA/QC procedures to be applied:	Detailed in Annex-4
Any comment:	The data would be archived for the Crediting Period + 2 years.

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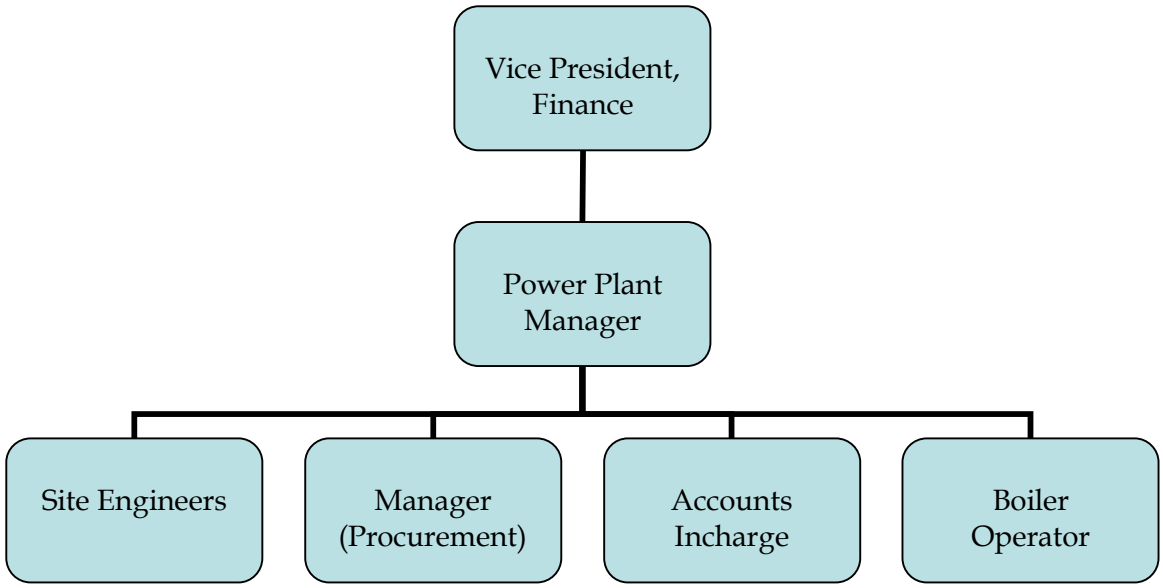
B.7.2 Description of the monitoring plan:

>>

Monitoring methodologies / guidelines mentioned in the UNFCCC document of "Annex B of the simplified modalities and procedures for small scale CDM project activities" for small scale projects (Type I: D) is considered as basis for monitoring methodology for the activity.

The project proponent will monitor the electricity exported to the grid using meters to be installed at the plant. As the project proponent may use coal in case of exigencies, the quantity of coal consumed during the crediting period and the calorific value of the same will also be monitored. Additionally, the project proponent would also monitor the quantity of biomass used and the calorific value for the same. For start up purposes, RPGPL may import power from the grid. The project proponent would also monitor the quantity of power imported through meters to be installed at the plant. The monitoring plan is detailed in Annex 4 as well.

Project proponent formed a CDM team/committee comprising of persons from relevant departments, which will be responsible for monitoring of all the parameters mentioned in this section. The organizational structure has been provided below:



The VP (Finance) would be responsible implementation of the M&V Protocol. He would be responsible for ensuring adequate availability of resources in terms of manpower, capital and infrastructure for implementation of the protocol. He would also be responsible for carrying out internal audit on a regular basis to understand the effectiveness of the system, to identify deviations from the planned activities and undertake necessary measures for avoidance of such deviations in the future.

The VP, Finance would be assisted by the Plant Head who would hold the responsibility for the Operations & Maintenance of the plant. He would be assisted by a team of Electrical and Mechanical Engineers at the plant site. They shall be responsible for the Operation & Maintenance of all major machinery, maintaining

logbooks, preparing periodic summary reports and also for maintaining and issue various spare parts and consumables. They would follow and ensure adherence to the Manufacturers guidelines for the operation and maintenance of the plant. The Engineers at the site would also be responsible for carrying out day to day activities like monitoring and measurement of the various parameters to be monitored, recording of the parameters in electronic/paper format and storage of the data for retrieval in the future. They would also be responsible for ensuring calibration of the monitoring equipment as per the planned schedule. They would provide a report on the activities carried out to the Plant Head. The Manager (Procurement) would be responsible for monitoring of the quantum and quality of the fuel purchased. The Accounts personnel would be responsible for invoicing for the sale to the State Utility and recording of the data on a monthly basis.

Emergency Preparedness

The operational staff's main task is to keep a close watch on a day to day basis on the functioning of the major equipment in the power plant. The operating staff would also document the downtime and operating hours for each turbine along with the reasons for the downtime. The operating staff would summarize the logbook data on a monthly basis and provide the same to the head office.

The maintenance staff at the plant would be responsible for ensuring minimal breakdown of the major equipment. They would be imparted training based on the requirements of the individual maintenance functions like, mechanical, electrical, instrumentation etc. The basis for the training shall be the Plant's operating and Maintenance Manual Particulars Book, which is compiled from the manufacturer's instructions, the contract documents and the drawings. The training program would include lectures, expositions by experienced plant operators and maintenance personnel, informal discussions and visits to operating plants and manufacturer's works. Exposure to the courses conducted by Institutions like Power Plant training Institute would be given to the operating & maintenance staff. The maintenance staff would be imparted training in the emergency procedures as well.

Additionally, it will ensure supply of sufficient quantity of critical and essential spares and consumables for the requirement of the machines. These critical and essential spares and consumables shall be stocked at the project site to reduce the machine repair downtime. A complete set of tools and tackles will be maintained at the site at the project site. The site in-charge together with the staff would ensure that periodic maintenance checks are performed on all major components.

RPGPL would also maintain spare meters at the site. In case, if any of the meters are found to be providing faulty readings, they will be replaced with the spare meters. The spare meters will also be calibrated on an annual basis.

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

>> 06/02/2008

Rayapati Power Generation Private Limited (Project Proponent).

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

03/12/2005

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

>>

20 Years.

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

The project promoter intends to apply for a **Fixed Crediting Period.**

C.2.1. Renewable crediting period

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

01/05/2008

If the registration of the project is after 01/05/2008, the date of registration would be considered as the start date for the fixed crediting period

C.2.2.2. Length:

>>

10y-0m

SECTION D. Environmental impacts

>>

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

>>

The project being a renewable energy biomass based power project it does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. As per the government of India notification based on environment protection rule, 1986, public hearing and EIA is required for those industries/projects which are listed in the predefined list of ministry of environment and forest. Thermal power projects with investment of less than Rs. 100 crore have been excluded from the list. Hence, it is not required by the host party.

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:

>>

The environmental impacts are not considered to be significant by the project participant or the host party. However, the following measures are planned to be undertaken by RPGPL at the project site:

Environmental Measures adopted by RPGPL:

Air Pollution: A stack of height 60m, based on the guidelines given by the pollution regulations, for dust and SO_2 emissions into the atmosphere has been provided. The temperatures encountered in the steam generator are expected to be low enough to produce Nitrogen Oxides. An Electrostatic Precipitator would also be installed in the power plant.

RPGPL would also be monitoring the concentration of SPM and the SO2 from the stack emissions on a regular basis. The laboratory attached to the power plant would be equipped with the necessary instruments for carrying out air quality monitoring.

Solid Waste: Fly ash collected from the ESP hoppers and the air-heater hoppers and the ash collected from the furnace bottom can be used as landfill or would be sold to brick manufacturers. The furnace bottom ash will be collected separately in water submerged ash conveyors. The fly ash from the ESP and other hoppers in the boiler will be collected separately for disposal.

Water pollution: Hydrochloric acid and sodium hydroxide would be used as regenerants in the proposed mixed bed plant of the RO plant. The acid and alkali effluent generated during the regeneration process of the ion-exchangers would be drained into a lined underground neutralizing pit. Generally these effluents are self neutralizing. However, provisions will be made such that the effluents will be neutralized by addition of either acid or alkali to achieve the required pH of about 7.0. The effluent will then be pumped into the effluent treatment ponds which form part of the power plants effluent dispoal system. The neutralizing pit will be sized approximately for 15 Cu.m. The rejects from the RO plant will have high TDS which could be diluted and used for cleaning purposes in the project.

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In the condenser cooling water, residual chlorine of about 0.2ppm will be maintained at the condenser outlet. This chlorine dosing would be done mainly to prevent biological growth in the cooling tower system. This value would not result in any chemical pollution of water and also meets the national standards for the liquid effluent.

The sewage from the various buildings in the power plant area will be conveyed through the separate drains to the septic tank. The effluent from the septic tank will be disposed in soil by providing disposing trenches.

Thermal pollution: A closed circuit cooling water system with cooling towers will be installed to eliminate thermal pollution. Blow down from the cooling tower will be trenched out and ultimately conveyed to the drainage.

Noise Pollution: The rotating equipment in the power plantnt will be designed to operate with a total noise level of not exceeding 85 to 90 dB(A) as per the requirement of the Occupational Safety and Health Administration (OSHA) standards. The rotating equipment will be provided with silencers wherever required to meet the noise pollution.

SECTION E. Stakeholders' comments

>>

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

>>

The local stakeholders were identified based on the impact or the possibility of impact due to the project activity. The Plant management and the Corporate Headquarter together identified the following as their local stakeholders:

a) Office bearers and residents of the neighbouring villages, b) Suppliers c) Representative of CSEB, d) Transporters, e) Local employees, f) Local NGOs

The opinion of the institutional stakeholder about the project activity is reflected in the approvals received by RPGPL. However, in order to provide the local villagers, the biomass suppliers and other individuals an opportunity to express their view on the project activity and build a rapport with the local population, RPGPL decided to conduct a stakeholder meeting in its plant and invitations were sent in advance intimating them about the day, time, venue and the purpose of the meet.

The stakeholder meeting was conducted at RPGPL's proposed plant site on the 30th of August 2006 and was attended by the office bearer and the residents of Thakurtola, biomass suppliers and the employees of RPGPL, representative of the CSEB.

In the meeting, the VP, Finance of RPGPL, welcomed the attendees to the meeting. He described the activity that RPGPL was planning to undertake at the site and gave a brief idea about biomass based power plants. He then informed the project participants about the purpose of the meet, a brief idea on Clean Development Mechanism and how the project would result in Greenhouse gas description.

Subsequently, all the stakeholders were invited to comment on how the project activity had affected their lives and about their expectations from the project activity. A summary of the comments received is in Section E.2

E.2. Summary of the comments received:

>>

Summary of the comments received from the stakeholders:

Office bearer of Thakurtola and villagers: The Sarpanch of Thakurtola expressed pleasure with the setting up of the power project as it had provided the rural population with permanent employment opportunities. Also, the taxes to be paid by RPGPL would help in providing improving the services for the villagers. The villagers expected creation of indirect employment opportunity for some of them due to the project activity. Also, they expected the power situation in their village to improve after the commissioning of the plant.

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Representative of CSEB: Stated that the power situation in the region was expected to improve with the setting up of the power project.

Employees: The villagers expressed their satisfaction with the setting up of the project activity as it provided them with a permanent employment opportunity and obviated the need for them to travel long distances for jobs.

Biomass Suppliers: The biomass suppliers too supported the setting up of the project as it would provide them with permanent employment opportunity. They also stated that business opportunity for transporters would also be created due to the setting up of the project activity.

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

>>

All comments received were positive. No improvement opportunities were identified.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Rayapati Power Generation Limited
Street/P.O.Box:	HO: #6-3-900/9, Flat No.203 & 204
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URL:	
Represented by:	
Title:	Vice President, Finance
Salutation:	Mr.
Last Name:	Rajkumar
Middle Name:	
First Name:	
Department:	Finance
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Direct tel:	91 40 23414545
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING IS AVAILABLE FOR THE PROJECT.

Annex 3

BASELINE INFORMATION

The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Build Margin and the Simple Operating Margin for the Western grid, the details of which is available on the following website and is detailed below as well:

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

Version 3.0 of the database has been used.

Gross Generation Total (GWh)

	2004-05	2005-06	2006-07
West	183955	188606	199,346

Net Generation Total (GWh)

	2004-05	2005-06	2006-07
West	170726	176003	185,493

20% of Net Generation (GWh)

	2004-05	2005-06	2006-07
West	34145	35201	37,099

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2004-05	2005-06	2006-07
West	8.8	12.0	13.9%

Net Generation in Operating Margin (GWh)

	2004-05	2005-06	2006-07
West	155731	154918	

Net Generation in Build Margin (GWh)

	2004-05	2005-06	2006-07
West	35257	35425	38,242

Emission Data

Absolute Emissions Total (tCO2)

	2004-05	2005-06	2006-07
West	157781065	153933199	157,722,686

Absolute Emissions OM (tCO2)

	2004-05	2005-06	2006-07
West	157781065	153933199	157,722,686

Absolute Emissions BM (tCO2)

	2004-05	2005-06	2006-07
West	26881491	22318133	22,707,948

Emission Factor

Simple Operating Margin (tCO2/MWh)

	2004-05	2005-06	2006-07
West	1.01	0.99	0.99

Build Margin (tCO2/MWh)

	2004-05	2005-06	2006-07
West			0.59

Annex 4

MONITORING INFORMATION

Monitoring Plan

Power:

The power generated, exported and imported shall be monitored on a continuous basis using high precision electric meters of 0.5 class accuracy capable of recording the export of energy to the grid and the import of energy from the grid.

For the power sold to the board, joint monthly readings in respect of power exported to the Board shall be taken by the authorized representative of the board and RPGPL. The company shall submit monthly invoice of energy sold and these shall be used for the estimation of CERs at the time of verification.

For applying monthly bill to CSEB, the meter readings will be taken on the last day of every month by CSEB officials in presence of company representatives and readings will be jointly certified.

The Plant will be equipped with energy meters/export meters for monitoring and control purpose. The energy meters will be tested and calibrated utilizing a standard meter. The standard meter will be calibrated once in a year at the approved laboratory of Govt. of India or Govt. of Chhattisgarh as per terms and conditions of supply. The tests of meters will be jointly conducted by authorised representatives of both the parties and the results and correction so arrived at mutually will be applicable and binding on both the parties. The energy meters will not be interfered with, tested or checked except in the presence of representatives of company and CSEB.

Data Uncertainty

If any of the meters is found to be registered inaccurately, the affected meter will be immediately replaced. The meters will be checked in presence of both the parties on mutually agreed periods. If during the test checks both the meters are found beyond permissible limits of error, both the meters will be immediately replaced and the correction applied to the consumption registered by the main meter to arrive at the correct energy exported for billing purposes for the period of one month up to the time of test check, computation of exported energy for the period thereafter till next monthly reading will be as per the replaced meter. Corrections in exported energy will be applicable to the period between the two previous monthly reading and the sate and time of test calibration in the current month when error is observed. If both the both and check meters fail to record or if any of the PT fuses are blown out, the export energy will be computed on a mutually agreeable basis for the point of defect.

Fuel

The quantity and the type of fuel supplied to the plant shall be monitored and recorded on a daily basis at the plant. A weigh bridge would be used to measure the quantity of the biomass procured by the plant. For fuel accounting, the following documents would be maintained at the plant site.

- Material Inward Slip

CDM – Executive Board

- Yard Register
- Goods Receipt Note

RPGPL would undertake monthly laboratory testing to analyze the calorific value of the biomass used in the plant. In case varying sources of fuel are used, the testing would be done on a weekly basis.

The quantity of biomass consumed during the crediting would be monitored on daily basis. The weigh bridge installed at the site would also be used to monitor the amount of biomass procured at the plant site. Similarly, the total quantity of coal procured and consumed on a daily basis would be monitored using weigh bridges installed at the plant site. The daily consumption of fuel would be estimated by monitoring the speed of the variable feed drives of the fuel feeders.

Batch-wise laboratory testing would be undertaken for the coal that may be used in the plant during exigencies. Additionally, the % carbon in the coal will be also be monitored for calculation of the project emission.

Bomb Calorimeter:

The water equivalent in this weight of water, which is equivalent in effective heat capacity to the entire system. (Calorimeter vessel containing a specified weight of water, calorimeter bomb charged with oxygen, fuel and water, DDT/FU and stirrer). Since the specific heat of water is 1.000± 0.002 cal/gm°C in the range of 10° to 40° C, The water equivalent is cap. Equals to the effective heat capacity (cal/°C), the factor that is determined experimentally. Since the true water equivalent is not required and is never evaluated, it is the effective heat capacity, which should be considered. The effective heat capacity has a temperature because of its use in thermo chemical calculations and because the specific heat of water in the range of 25° to 40° is constant within ±0.002 cal/g°C.

The effective heat capacity of the system is determined by burning pure and dry benzoic acid weighing not less than 0.9 and not more than 1.1 gm. Determine the corrected temperature rise T from the observed test data. Compute the energy equivalent by substitution in the following equation:

W = HM/T

Where

W = Energy equivalent of calorimeter in calories per degree centigrade

H = Heat of combustion of standard benzoic acid in calories per gm.

M = Mass of standard benzoic acid sample in grams.

T = Corrected temperature rise in degrees centigrade.

Other Instruments:

Instruments installed in the Plant like pressure gauges, temperature gauges, flow meters etc shall be calibrated once in a year or as per the recommendations of the Supplier. The instruments shall be tagged with the calibration date and next calibration due date.

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Appendix A
Abbreviations

CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Certified Emission Reductions
CSEB	Chhattisgarh State Electricity Board
CSERC	Chhattisgarh State Electricity Regulatory Commission.
CSPCB	Chhattisgarh State Pollution Control Board
Cm	Centimeter
CO_2	Carbon Dioxide
DPR	Detailed Project Report
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
IREDA	Indian Renewable Energy Development Agency
Kcal	Kilo Calories
Kg	Kilogram
KM	Kilometer
KW	Kilowatt
kWh	Kilowatt hour
LP	Low Pressure
MNES	Ministry of Non-Conventional Energy Sources
MT	Metric Tons
MU	Million Units
MW	Megawatt
NCV	Net Calorific Value
NGO	Non Government Organizations
NOC	No Objection Certificate
PDD	Project Design Document
PLF	Plant Load Factor
PPA	Power Purchase Agreement
RPGPL	Rayapati Power Generation Private Limited
SEB	State Electric Board
TJ	Tera Joule
UNFCCC	United Nations Framework Convention on Climate Change

Appendix B
REFERENCE LIST

Sr. No	References
1.	Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) **http://cdm.unfccc.int**
2.	Website of United Nations Framework Convention on Climate Change, **http://unfccc.int**
3.	UNFCCC decision 17/CP.7: Modalities and procedures for a clean development mechanism as defined in article 12 of the Kyoto Protocol
4.	UNFCCC document: Appendix B to attachment 3, Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories
5.	Detailed project report on 7.5 Biomass based power project – Rayapati Power Generation Private Limited
6.	Website of Central Electric Authority (CEA), Ministry of Power, Govt. of India- **http://cea.nic.in**
7.	CEA published document "16th Electric Power Survey of India"
8.	Website of Ministry Non-Conventional Energy Sources (MNES), Government of India, **http://mnes.nic.in**
9.	Website of Indian Renewable Energy Development Agency (IREDA), **www.ireda.nic.in**
10.	**www.infraline.com/power/**
11.	Website of Climate Change Cell, Ministry of Environment & Forest, Govt. of India. **http://envfor.nic.in**
12.	Central Electricity Authority (CEA) website: www.cea.nic.in

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Appendix – C

	2008-09	2009-10	2010-11	2011-12	21012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Generation capacity , KW	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500
Plant load factor, %	90	90	90	90	90	90	90	90	90	90
No. of hours of plant operation per annum	7920	7920	7920	7920	7920	7920	7920	7920	7920	7920
No. of units generated in a year (Million KWh)	53.46	53.46	53.46	53.46	53.46	53.46	53.46	53.46	53.46	53.46
Auxilliary consumption per annum (Million KWh)	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35
No. of units exported to grid, millions (Million KWh)	48.11	48.11	48.11	48.11	48.11	48.11	48.11	48.11	48.11	48.11
Total units exported to grid	481.1									
No. of units replaced in the grid, millions units (Million KWh)	48.11	48.11	48.11	48.11	48.11	48.11	48.11	48.11	48.11	48.11
Net Calorific Value of Biomass (kcal/kg)	3300	3300	3300	3300	3300	3300	3300	3300	3300	3300
Specific Biomass Consumption (kg/KWh)	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226
NCV of Coal consumed	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
Coal Consumption	15000	15000	15000	15000	15000	15000	15000	15000	15000	15000
Specific Coal Consumption	1.445	1.445	1.445	1.445	1.445	1.445	1.445	1.445	1.445	1.445
Power Generation using Coal (Million KWh)	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38	10.38
Power Generation Using Biomass (Million KWh)	43.08	43.08	43.08	43.08	43.08	43.08	43.08	43.08	43.08	43.08
Power Exported to Grid Using Biomass (a)	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73
Expected Biomass Consumption	52834	52834	52834	52834	52834	52834	52834	52834	52834	52834
Power Generated using Biomass	43.08	43.08	43.08	43.08	43.08	43.08	43.08	43.08	43.08	43.08
Power Exported to Grid using Biomass (b)	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73
Power Imported from the grid	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
EGY (Minimum of a & b)	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73	37.73
Baseline Emission Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Baseline Emissions	29810	29810	29810	29810	29810	29810	29810	29810	29810	29810
Project Emissions	845	845	845	845	845	845	845	845	845	845
Emission Reduction	28965	28965	28965	28965	28965	28965	28965	28965	28965	28965

Net Present Value Analysis

(All figures in Lakh INR*)

	FYO1	FYO2	FYO3	FYO4	FYO5	FYO6	FYO7	FYO8	FYO9	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
Cash Accrual	198.3	305.7	184.5	16.1	25.3	24.0	29.7	38.3	45.6	27.9	196.7	156.4	111.3	61.6	6.7	34.5	119.6	191.9	271.0	357.2
Discounting Factor	16%																			
Present Value of cash accruals	171.0	227.2	118.2	8.9	12.1	9.8	10.5	11.7	12.0	6.3	38.4	26.3	16.2	7.7	0.7	3.2	9.6	13.3	16.2	18.4
Total Present Value	486.5																			
Equity Investment	863.9																			
Net Present Value	377.5																			
CDM Funds	153.5	153.5	153.5	153.5	153.5	153.5	153.5	153.5	153.5	153.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Present Value of the CDM funds	132.3	114.1	98.4	84.8	73.1	63.0	54.3	46.8	40.4	34.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Present Value	742.0																			
Net Present Value	364.5																			

1 Lakh = 0.1 Million

Figures in Red indicate negative number

Appendix E

Assumptions for NPV Calculations

1	Cost of the Project activity	INR 2879.8 Lakh
2	Equity Financiing	INR 863.9 Lakh
3	Capacity of the power plant	7.5 MW
4	Life time of the project	20 years
5	Auxiliary Consumption	10%
6	Tariff	For first ten year: As per tariff order of CSERC dated 11/11/2005. From 11th year to 20th year: Increase in 6 paise per unit considering the tariff in the year 10th year as the base.
7	Repairs & Maintenance cost	2.5% of the total project cost.
8	Biomass price	Rs. 900 per MT with year on year escalation of 5%.
9	Utilities	Rs. 8.00 Lakhs in the first year with year on year escalation of 5%
10	Wages	Rs. 30.00 Lakhs in the first year with year on year escalation of 10 %
11	Insurance	0.2% of the project cost in the first year with no escalation For current assets: 0.16 Lakhs in the first year with no escalation.
12	Other factory overheads	Rs. 5.00 Lakhs in the first year with year on year escalation of 10 %
13	Interest on Term loan	On term loan :11.5% On working capital: 13.00%
14	Plant Load Factor	80% in the first year 90% from second year onwards.
15	Tax	Tax Holiday for ten years MAT Rate of 8.415%. Income Tax: 33.66% effective tax rate
16	CER Price	10 Euros