



**CLEAN DEVELOPMENT MECHANISM  
SIMPLIFIED PROJECT DESIGN DOCUMENT  
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)  
Version 02**

**CONTENTS**

- A. General description of the small-scale project activity.
- B. Baseline methodology
- C. Duration of the project activity / Crediting period
- D. Monitoring methodology and plan
- E. Calculation of GHG emission reductions by sources
- F. Environmental impacts
- G. Stakeholders comments

**Annexes**

Annex 1: Information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline data

Annex 4: Monitoring Plan

Enclosure 1: Emission reduction calculations

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

&gt;&gt;

**Ecofren Power 8 MW Renewable Sources Biomass Power Project** (Project Name in Host Country)  
Approval: “8MW biomass power project” at Durg, Chhatisgarh by M/s Ecofren Power & projects Limited)  
**Version 02**  
**08/09/2006**

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

&gt;&gt;

Purpose

The purpose of the project activity is to utilize the abundantly available biomass fuels<sup>1</sup> especially rice husk in the region effectively for generation of clean power. The entire generated clean and green power will be exported to the power deficit state grid for sustainable economic growth, conservation of environment through use of biomass fuels and for Green House Gas (GHG) emission reduction. The project will also help to reduce the already existing huge demand and supply gap of electricity to some extent in the state of Chhattisgarh.

Ecofren Power & Projects Limited (EPPL) proposes to utilize the available fuel (rice husk) from the paddy rich areas in and around Raipur, Durg, Rajnandgaon districts, which are in the region considered as ‘Dhana Ka Khatori’ (Rice Bowl) region. A survey carried out indicates that the fuels to be used are available in abundance within a radius of 100 km from the plant site. The rice husk requirement for the operation of biomass plant at 100% capacity is around 70000 MT<sup>2</sup> per year as against the availability of 348000 MT of rice husk in the area. It is estimated that around 1.3 MT of rice husk is required for generation of one MW power. Considering the adequate availability of biomass in the area, EPPL have chosen the location of power plant in Chandkhuri village, Block Durg, Durg district, Chhattisgarh.

The following local benefits are also envisaged due to the setting up of project:

- Proper utilization of surplus and abundantly available biomass;
- Generation of eco-friendly green power;
- Avoidance of burning of agriculture waste;
- Reduction of CO<sub>2</sub> emissions

Contribution to Sustainable Development

The project activity is a renewable energy power project for power generation and export of clean power to Chhattisgarh State Electricity Board (CSEB). This generation of power will substitute the power generated and fed to conventional fossil fuels dominated grid.

---

<sup>1</sup> Sustainably grown renewable cyclic crops.

<sup>2</sup> Reference from the DPR prepared for power plant



Indian economy is highly dependent on “Coal” as fuel to generate energy and for production processes. Thermal power plants are the major consumers of coal in India and yet the basic electricity needs of a large section of population are not being met. This results in excessive demands for electricity and place immense stress on the environment. Changing coal consumption patterns will require a multi-pronged strategy focusing on demand, reducing wastage of energy and the effective utilization of Renewable Energy (RE) sources. Though Chhattisgarh state along with other two states in the country has more than 80% of the national coal reserves, the power generated from the existing coal based power plants is not enough to meet the electricity demands of the state.

Since this project activity utilizes renewable energy source, it will positively contribute towards the reduction in (demand) use of finite natural resource like coal/gas/oil, minimizing depletion or else increasing its availability to other important processes.

Government of India has stipulated the following indicators for sustainable development in the interim approval guidelines<sup>3</sup> for CDM projects.

1. Social well being
2. Economic well being
3. Environmental well being
4. Technological well being

Project activity contributes to the sustainable development in following ways:

#### 1. Social well being:

- Since, the project is proposed in a rural area, the project would lead to the more social development of the region.
- Since, the biomass resources are to be collected and transported to the plant site from the fields, opportunities are being generated for the rural people to collect and transport biomass. This will result in the enhanced employment of the rural people.
- More and more rural industries are expected to set up as a consequence to the power plant in the area. This also will cause infrastructure development in the area, which ultimately leads to the rural development and encourages rural entrepreneurship. This also prevents the migration of the rural poor to cities due to opportunities created by the power plant to larger extent.

#### 2. Economical well being:

- The project activity generates employment in the local area. The project will also provide economic value to agricultural and wood wastes and provides stable and quality power to neighboring and other industries in the state, farmers and households. The project will create a business opportunity for local stakeholders such as bankers, consultants, suppliers, manufacturers, contractors *etc.*
- The main resources for power generation are biomass fuels such as rice husk. Wood chips, crop residues *etc.* are not anticipated as the availability of rice husk is abundant. Rice husk is collected from the local rice mills and wood chips & Crop residues are collected from the farmers out of their field and brought to the project site thus generate an additional revenue on account of supply of these raw materials to the project, which are otherwise being under-utilized / burnt with low or no commercial value. In other words, the plant is generating commercial value to the rice husk and crop

---

<sup>3</sup> Ministry of Environment and Forest web site : [http://envfor.nic.in:80/divisions/ccd/cdm\\_iac.html](http://envfor.nic.in:80/divisions/ccd/cdm_iac.html)



residues enabling the local rice mill owners and farmers to get better price out of their produce augmenting their income. The above benefits due to project activity ensure that the project would contribute to the social and economic well being in the region.

### 3. Environmental well being

- Since, the project uses only biomass materials for power generation, which otherwise would have been a fossil fuel such as coal, lignite and gas, the project does not lead to GHG emissions. Combustion of biomass materials in the project result in GHG emissions of CO<sub>2</sub>, CH<sub>4</sub> and NO<sub>x</sub>. The major constituent of GHG emissions is CO<sub>2</sub> which about 98%, whereas CH<sub>4</sub> and NO<sub>x</sub> constitute the remaining 2%. This can well be evidenced from the typical ultimate analysis<sup>4</sup> of biomass materials, which indicates the Nitrogen content is within 1 to 2%, therefore CH<sub>4</sub> emission is negligible. Hence the CO<sub>2</sub> is considered as the only GHG emissions from the biomass combustion.
- Since the biomass is formed by fixing the atmospheric CO<sub>2</sub> by the action of photosynthesis in the presence of sunlight, the CO<sub>2</sub> released due to combustion of biomass is assumed to be equal to the CO<sub>2</sub> fixed by the photosynthesis. Again the CO<sub>2</sub> released during the combustion will be consumed by the plant species for their growth. In view of the above, biomass combustion and growth of biomass and associated CO<sub>2</sub> consumption and release can be treated as cyclic process resulting in no net increase of CO<sub>2</sub> in the atmosphere. Hence, the project will not lead to GHG emissions.

### 4. Technological well being

The technology selected for the proposed project is a more energy efficient technology due to the features discussed below.

The project uses a steam turbo generator with matching boiler with fluidized bed combustion technology capable of firing multiple fuels. This is a more efficient than the all other kind of combustion systems in boilers, which is capable of firing not only rice husk but also many other kind of fuels. The auxiliary power consumption of the FBC boiler is also comparable to other type of boilers like traveling grate type boilers.

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

#### **A.3. Project participants:**

>>

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 (Host)	Ecofren Power & projects Limited (Private entity)	No

*See contact information in Annex-1 to this PDD*

<sup>4</sup> Chemical analysis of elements in the fuel (biomass).

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

&gt;&gt;

The project activity is 8 MW capacity grid-connected biomass based renewable energy power plant with high-pressure steam turbine configuration. On an annual average basis, the project is expected to export around 45 million kWh of power per annum to the CSEB grid by considering auxiliary power consumption of around 12%. As per MNES guidelines and consent to operate received for the project, use of coal as a fuel is allowed maximum up to 25%, on annual basis. Although EPPL proposes to use coal in case of shortage of biomass only, maximum use of coal (25%) has been considered for estimation of project emissions to arrive at conservative figure of GHG emission reductions. EPPL will be using coal from mines near Korba area in the plant, as per the availability. To arrive at the average CO<sub>2</sub> emission factor of coal, calorific value of Indian coal (3200 kcal/kg) has been considered for calculations and actual figures of calorific values and carbon contents needs to be used during the verification. Further, no transmission and distribution losses are considered while calculating GHG emission reductions, since the project exports power to the CSEB grid, which is located at about 13 km from the site.

The power plant has one condensing steam turbo generator unit with a matching boiler with FBC technology capable of firing multi fuels with rice husk, wood chips and crop residues as the main fuels. All necessary auxiliary facilities of the power plant are provided. The boiler is sized to produce a maximum of 35 tons per hour of steam. The steam turbine is a straight condensing type machine with uncontrolled bleeds for deaerator feed water heating. The steam conditions at the boiler heat outlet are at a pressure of 67 kg/cm<sup>2</sup> and temperature of 485<sup>0</sup>C. The higher steam parameters result in higher annual savings of fuel per annum when compared to lesser steam operating parameters.

All the steam based power plants operate under the Rankine cycle where it is the combination of the various process like the isentropic compression of water in the boiler feed water pumps, reversible heat addition to the working fluid through the liquid, two phase and superheat states, isentropic expansion of the working medium in the turbine and constant pressure heat rejection to the atmosphere through the condenser and the cooling water system, The cycle to be adopted for the proposed project activity will be modified Rankine Cycle with the addition of the 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. Because of the size of the plant there are limitations in the use of the number of stages for heating the feed water, and for this project only one stage of heating is done in a deaerator. Thermodynamically, energy recovery from the Rankine cycle is more dependent on the steam inlet temperature than the pressure and the higher the inlet steam temperature, higher the cycle efficiency.

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

&gt;&gt;

**A.4.1.1. Host Party(ies):**

&gt;&gt;

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

&gt;&gt;

**Chattisgarh state****A.4.1.3. City/Town/Community etc.:**

&gt;&gt;

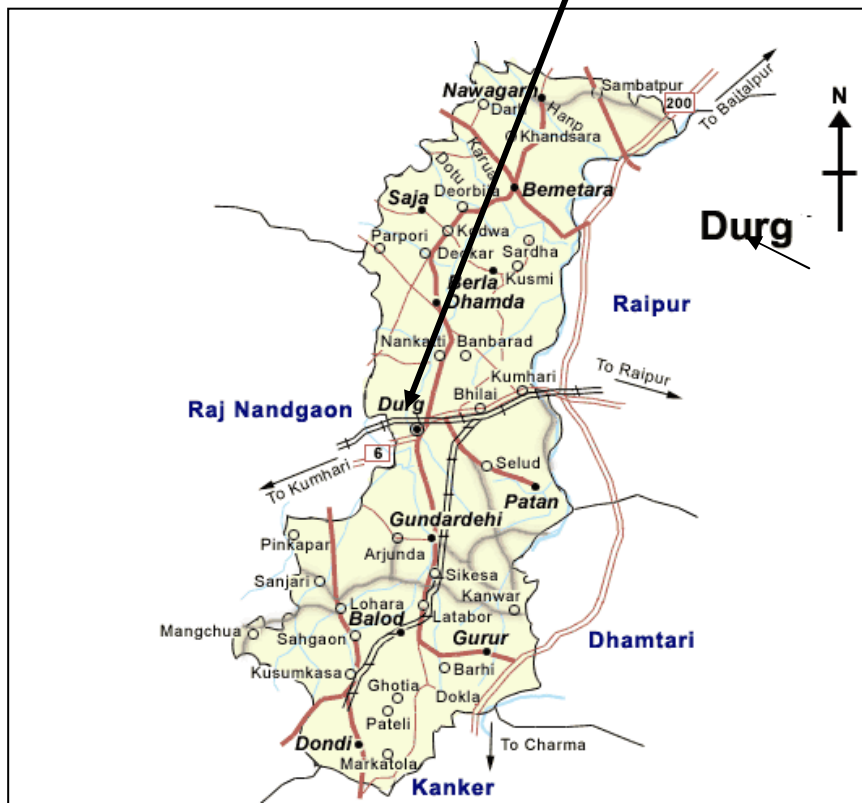
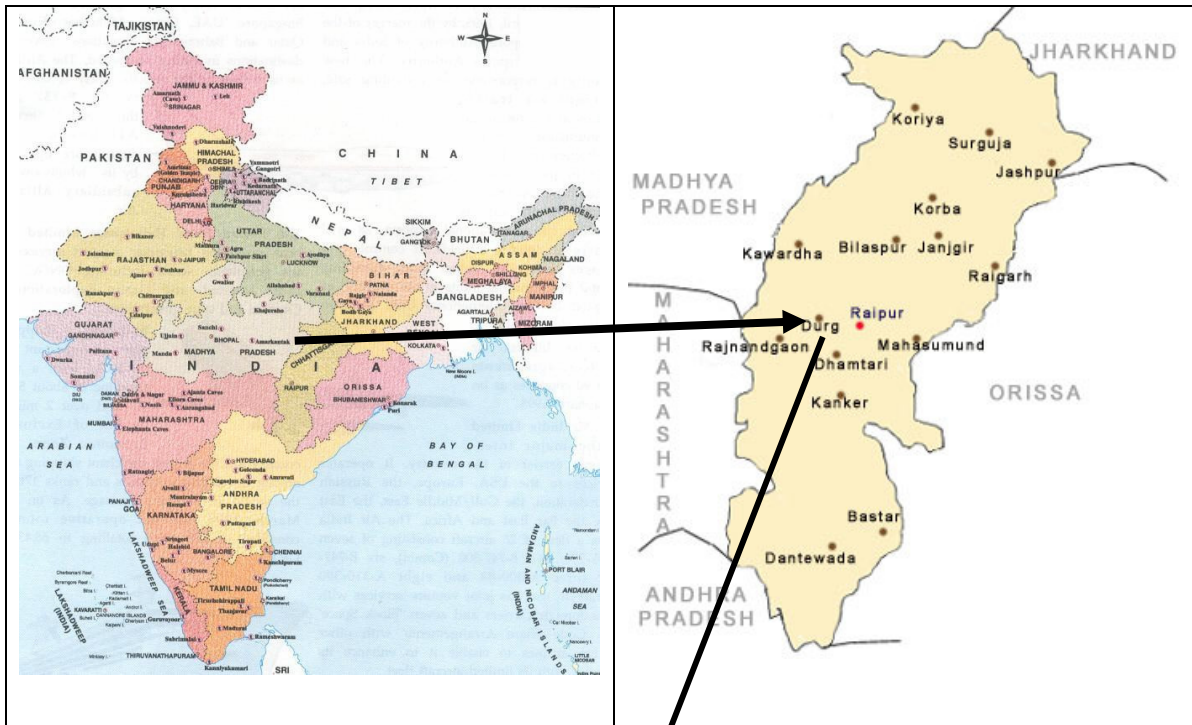
**Durg district**

**A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):**

&gt;&gt;

The plant is located at Chandkhuri village, Durg block, Durg district, Chhattisgarh. The site for the plant has been acquired and the plot area measures around 18 acres. The site is well connected by roads and railway line and the nearest railway station is at Durg and airport is at Raipur. Plant is located at a latitude of 22°23'N and longitude of 80°46'E.

The site is generally plain and is more suitable for paddy crop. The plant's water requirements will be met by drawl from borewells, with in the plant. Power generated from the plant at 11 kV stepped to 33 kV and is being evacuated to Chhattisgarh State Electricity Board (CSEB) grid through their 132 kV/33 kV Ruvabandha sub station which is about 13 km from the plant.



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

&gt;&gt;

As per Clause 2 of Type I.D of Appendix B of **simplified modalities and procedures for small-scale CDM project activities (Version 09: 28 July 2006, Scope 1)**, in case of unit which co-fires renewable biomass and 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.

Since the project activity is an 8 MW renewable biomass based power project, it qualifies as a small scale CDM project activity as per the Clause 2 of Type I.D of Appendix B of Simplified modalities and procedures for small-scale CDM project activities (Version 09: 28 July 2006, Scope 1).

Therefore, the proposed project activity can be defined under

**Type I:** Renewable Energy Project (Small Scale)

**Category:** “D”, Grid connected Renewable Electricity Generation (Biomass based Power Project)

**Technology of the project**

The technology adopted for the project activity is a standard and widely accepted practice for power generation using renewable sources. No technology transfer is required though know how for the project technology was not well established during project implementation stage in the state. Steam is generated in a high pressure boiler which is sized to produce a maximum of 35 tons per hour of steam. High pressure steam is passed through a straight condensing type machine with uncontrolled bleeds for de-aerator feed water heating to generate power to export to grid.

**A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:**

&gt;&gt;

The power plant uses environmentally sustainable grown biomass and in case of exigencies can use coal as fuel. The GHG emissions of the combustion process mainly CO<sub>2</sub>, is consumed by plant species, representing a cyclic process. Since, the biomass contains only negligible quantities of other elements like Nitrogen, Sulphur *etc.* release of other GHG are considered as negligible. The biomass is CO<sub>2</sub> neutral and thus environmentally benign limiting greenhouse effect.

Conventional energy equivalent of around **446.94** Million kWh for a period of 10 years in Chhattisgarh would be replaced by exporting power from the 8 MW non-conventional renewable sources biomass based power plant thereby resulting in CO<sub>2</sub> emission reduction of around **214,880** tones. In the absence of the proposed activity, the same energy load would have been taken-up by thermal power plants and emission of CO<sub>2</sub> would have occurred due to combustion of conventional fuels like coal / gas.

As per the prevailing policy of Government of Chhattisgarh and provisions of CSEB, power is exported to the grid in accordance with the Power Purchase Agreement (PPA) duly approved by CSEB.

According to the draft 16<sup>th</sup> electrical power survey conducted by the Central Electricity Authority (CEA), the projected growth in the total energy consumption is expected to be 7.5 % per annum for the period



1997-98 to 2004-05. However, the projections were not made for newly formed states including the state of Chhattisgarh. The Government of Chhattisgarh has done separate study which is presented in their 'Position Paper – Power'<sup>5</sup> a part of the final report on infrastructure development action plan for the Chhattisgarh state, in which power deficit for the state has been projected. In lieu of this, CSEB is expected to buy power continuously from EPPL to meet the demand of the power in the state. Also, to fulfill the guidelines from MNES<sup>6</sup> to produce at least 10% of the energy in the country using renewable energy sources, it is very likely that state would support power generation from renewable energy sources in the future as well. Though there are no such guidelines in the state to have minimum percentage generation using renewable sources, but it is likely that with the increase in more number of biomass based power plants in the state, the government would support this clause.

The power plant not only justifies the shortage of power availability and energy but also the eco-friendly power generation.

#### **A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:**

>>

Years	Annual estimation of emission reductions in tonnes of CO <sub>2</sub> e
2007-08*	21488
2008-09	21488
2009-10	21488
2010-11	21488
2011-12	21488
2012-13	21488
2013-14	21488
2014-15	21488
2015-16	21488
2016-17	10744
Total estimated reductions (tones of CO <sub>2</sub> e)	214880
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO <sub>2</sub> e)	21488

\*: The above estimation is considering that the project will be registered on December 31, 2006. However, the crediting period can start before January 1, 2007 if the project is registered with UNFCCC before December 31, 2006.

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

>>

No public funding from parties included in Annex I is available to the project. Project is implemented with equity of project proponent (EPPL) and long term debt by Indian bank.

<sup>5</sup> Chhattisgarh.nic.in/opportunities/power.pdf

<sup>6</sup> Powermin.nic.in

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

&gt;&gt;

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.

With reference to the criteria mentioned, this biomass power plant is not a de-bundled component of a large project activity as there is no registered small scale CDM project activity (previous 2 yrs) or an application to register another small scale CDM project activity by the same (EPPL) project proponent, in the same project category and technology/measure with project boundary within 1 km radius of this project activity.

In addition to this, there is also a restriction to set up biomass based power plant in the region by the Government of Chhattisgarh that only single project license is allowed to set up the plant in the Durg district at the moment.

**SECTION B. Application of a baseline methodology:****B.1. Title and reference of the approved baseline methodology applied to the small-scale project activity:**

&gt;&gt;

**Title:**

Grid connected renewable electricity generation

**Reference:**

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

Details of methodology for baseline calculations for CDM projects of capacity less than 15 MW are available in the “Appendix B of the simplified modalities and procedure for small scale CDM project activities”. Reference has been taken from indicative simplified baseline and monitoring methodologies for selected small scale (CDM projects less than 15 MW) project activity categories.

Renewable technologies that supply electricity to the grid are covered in category I.D (Version 09: 28 July 2006, Scope 1). The category comprises renewable such as small hydro, wind, geothermal and biomass that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or nonrenewable biomass fired generation unit.

**B.2 Project category applicable to the small-scale project activity:**

&gt;&gt;

**Type I:****Renewable Energy projects****Category:****I. D Grid connected renewable electricity generation**

As per the Kyoto Protocol (KP) baseline should be in accordance with the additionality criteria of article 12, paragraph 5(c), which states that the project activity must reduce emissions that are additional to any that, would occur in the absence of the certified project activity.

Document Annex B to attachment 3 regarding indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, provides guidelines for preparation of Project Design Document (PDD) including baseline calculations. The category and the sub type of the activity are given above.

Baseline methodology mentioned in the paragraph no. 9 of Type I. D. of Annex B of the simplified modalities and procedures for small scale CDM project activities, states that the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO<sub>2</sub>/kWh) calculated in transparent and conservative manner as under:

- a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002, Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered.

OR



- b) The weighted average emissions (in kgCO<sub>2</sub>equ/kWh) of current generation mix. The data of the year in which project generation occurs must be used.

Calculations must be based on data from an official source (where available) and made publicly available.

Based on the above guidelines provided in Version 09 of AMS I.D, the baseline emission factor is estimated using the combined margin approach as per the procedures laid in ACM0002.

A complete analysis of Western regional grid has been carried out with the study of various related issues like technology scenario, policy matters, economic conditions, development of renewable energy projects etc. for preparation of baseline scenario and calculation of baseline emission factor of the grid.

**B.3. 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 the 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) ;

**1. Financial barrier**

The CDM fund for the project was initially considered to cover the project risk related to the fuel (biomass) price increase in the future. The CDM fund is critical considering biomass availability and prices are seasonal, which depends on many external factors whereas the earnings for the power plant are at long term fixed rate. Therefore, the revenue from CDM could prove to be vital, as they would significantly improve the sustainability of the project, as the project can be rendered financially unstable due to increase in cost of fuel.

In addition to the above, the financial analysis of the project is done with and without considering CDM revenue. The IRR of the project without consideration of CDM is 9.55 % and with consideration of CDM is around 17.83%. The IRR with CDM is calculated as follows:

CER generation per annum : 21488

Rate per CER : 8 Euros

Based on the changes in the price of the raw material over the last two years, It is very likely that the cost of the raw material will increase in the future as well and in absence CDM funds it is very likely that project activity would have used (or may use) more financially viable option such as coal as fuel.



Raw material cost since the inception (say documented at Detailed Project Report (DPR)) has increased from average Rs. 350 to Rs. 1150 per Metric Tone (MT) of biomass. This is mainly due to the successful operation of similar kind of projects on other parts of the state and more demand to the raw material.

The cost of generation per unit during the DPR preparation was estimated at Rs. 2.25 / kWh, which is expected to increase to Rs. 2.40/kWh during construction stage due to increase in raw material cost. Also, the cost of power purchase by CSEB as per PPA is only Rs. 2.25 per unit. Though third party sales are allowed in the state, around 3% wheeling charges will be levied on EPPL for every unit sold to third party. This would result in heavy financial losses and put an additional burden on the financial sustainability of the project.

### **CDM Benefit**

	CERs	Rate/CER (Euros)	Exchange rate	Million INR	Million Units replaced (kWh)	Cost per unit (Rs.)
<b>EPPL</b>	214880	8	55	94.55	446.94	0.21

The CDM benefit per unit (kWh) of power replaced is about Rs. 0.21. Hence, the total benefit for EPPL including the tariff cost of Rs. 2.25 would amount to Rs. 2.46 which is marginally more than the cost of generation i.e. Rs 2.40 per unit.

It is envisaged that the raw material cost would further increase, which would lead to further increase in the cost of generation.

Thus, the project justifies the need of CDM funds for the project activity, which will help in significantly improving the project competitiveness and financial sustainability affected by increase in raw material cost.

## **2. Policy related barriers**

Though the Government of Chhattisgarh, with the help of CREDA is promoting the generation of power using biomass, Government has made a policy to allow single licensee to set up the power plant in one district considering the fuel availability. However, there are some exceptions in the present scenario wherein more than one licensee is allowed to set up plant due to adequate availability of the raw material. With the successful operation of biomass based power plants in the state, there may be a likely policy change by Government to allow more licensees to set up the plants in one district. Presently there is no permission to set up another plant in Durg district where EPPL is setting up the plant. With the likely changes in the policy to allow more plants to set up in the area in future, there could be a fuel shortage to the plant which subsequently leads to abnormal increase in the raw material price which will prove unsustainable to the project operation.

Considering the availability of more than 80% of coal reserves in the state with other two more states (Jharkhand & Orissa)<sup>7</sup>, the low cost of generation of electricity using coal could pose threat to the supportive policies from the government for the renewable energy based power plants in the state. There are also proposals to set up around more than 6000 MW power plants using coal as fuel in the state to

<sup>7</sup> Vision document: Chattisgarh 2010: [http://www.natcomindia.org/perspective\\_plans\\_states/chattisgarh.pdf](http://www.natcomindia.org/perspective_plans_states/chattisgarh.pdf) (Page no. 58)



meet future demands. This is mainly due to easily available low grade coal which encourages to set up low cost pit head based thermal power plants.

In addition to above, there is also a clause to pay minimum demand charges to the tune of Rs. 5 million every year towards drawing power from grid during start up of the plant even if plant uses start up power once or twice in a year. This may put an additional burden on financial status of the project.

### 3. Other barriers

Human component: EPPL has ventured in to power business for the first time. The core business for the project proponent is in cold storage units. 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.,

This discussion suggests that there are clear threats and barrier to the proposed project activity, which can be mitigated to certain<sup>8</sup> extent from CDM benefit.

<b>B.4. Description of how the definition of the project boundary related to the <u>baseline methodology</u> selected is applied to the <u>small-scale project activity</u>:</b>
--

>>

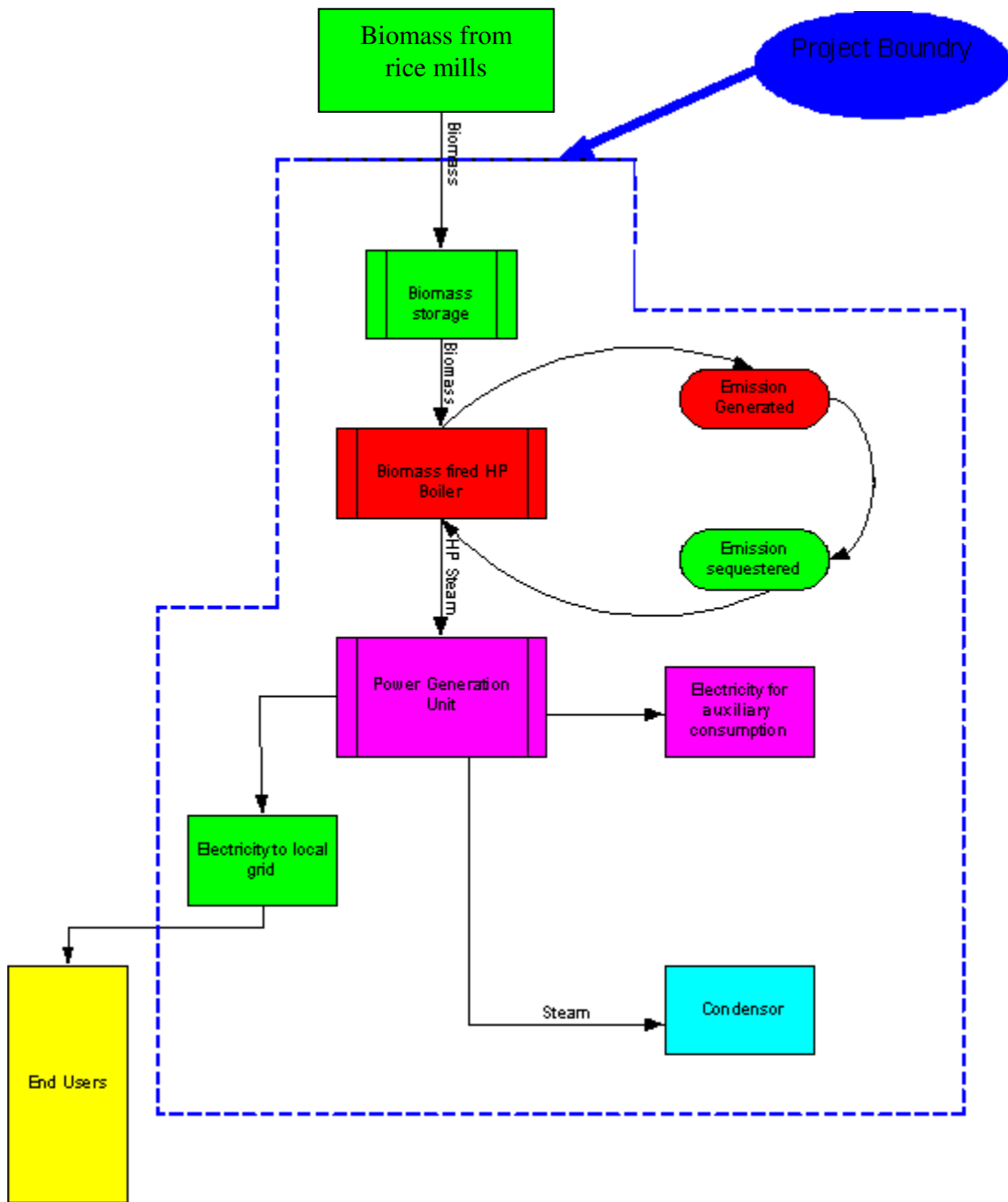
As per the guidelines mentioned in Type I. D. of Annex B of the simplified modalities and procedures for small-scale CDM project activities, project boundary encompasses the physical and geographical site of the renewable generation source.

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. However, for the purpose of calculation of baseline emissions, Western region grid is also included in the project boundary. As the plant uses only biomass residues or wastes (Rice husk), 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 and electricity grid.

---

<sup>8</sup> Uncertainty related to carbon market and cash flows is also a deterrent.



**B.5. Details of the baseline and its development:**

&gt;&gt;

As per ACM0002, Version 06 for project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described below.

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 per the latest guidelines in I.D to estimate the baseline emissions, the emission factor is calculated as per the procedures laid in paragraph 9 (c) and 9(d). As this methodology suggested is similar to the procedures laid in ACM0002, the same has also been referred for calculations. The baseline emissions and the emission reductions from project activity are estimated based on the quantum of electricity to be exported by the project activity to the grid and the **Baseline Emission Factor (BEF)** of the Western regional grid calculated as a **combined margin (CM)**, consisting of the combination of **operating margin (OM)** and **build margin (BM)** factors according to the three steps described in Annex 3.

Date of completing the final draft of this baseline section (*DD/MM/YYYY*):

30/08/2006

Name of person/entity determining the baseline:

Ecofren Power & Projects Limited who is a project participant and associated experts (as mentioned in Annex-I)



**SECTION C. Duration of the project activity / Crediting period:****C.1. Duration of the small-scale project activity:**

&gt;&gt;

**C.1.1. Starting date of the small-scale project activity:**

&gt;&gt;

Project start date: 01/11/2004.

**C.1.2. Expected operational lifetime of the small-scale project activity:**

&gt;&gt;

Life time of the project: 25 years

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

&gt;&gt;

**C.2.1. Renewable crediting period:**

&gt;&gt;

Not Used

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

&gt;&gt;

Not Used

**C.2.1.2. Length of the first crediting period:**

&gt;&gt;

NA

**C.2.2. Fixed crediting period:**

&gt;&gt;

**C.2.2.1. Starting date:**

&gt;&gt;

From the date of registration (01/01/2007)

(Considering the date of registration as December 31, 2006. The crediting shall start prior to the date proposed if the project is registered with UNFCCC before December 31, 2006.)

**C.2.2.2. Length:**

&gt;&gt;

10 Years (10-y)

**SECTION D. Application of a monitoring methodology and plan:**

&gt;&gt;

**D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:**

&gt;&gt;

**Title:**

Grid connected renewable electricity generation

**Reference:**

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

Details of monitoring methodology for CDM projects of capacity less than 15 MW are available in the “Appendix B of the simplified modalities and procedure for small scale CDM project activities”. Reference has been taken from indicative simplified monitoring methodologies for selected small scale (CDM projects less than 15 MW) project activity categories.

Renewable technologies that supply electricity to the grid are covered in category I.D (Version 09: 28 July 2006). The category comprises renewable such as small hydro, wind, geothermal and biomass that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or nonrenewable biomass fired generation unit.

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, Version 09: 28 July 2006) is considered as basis for monitoring methodology for the activity. The document states that the monitoring shall consist of metering the electricity generated by the renewable technology.

**D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:**

&gt;&gt;

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.

Details of approved methodology for baseline calculations for CDM projects of capacity less than 15 MW are available in the “Appendix B of the simplified modalities and procedure for small scale CDM project activities”. As the power plant is of 8 MW capacity, reference has been taken from indicative simplified baseline and monitoring methodologies for selected small scale (CDM projects less than 15 MW) project activity categories.

**D.3 Data to be monitored:**

&gt;&gt;

ID number (Please use numbers to ease cross-referencing to table D.6)	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	For how long is archived data to be kept?	Comment
D.3.1	Power	Electricity generated	KWh	Measured	Continuous	100%	Electronic	Credit period + 2 years	From the energy meter in the plant control room
D.3.2	Power	Auxiliary consumption	KWh	Estimated	Continuous	100%	Electronic	Credit period + 2 years	The auxillary consumption will be monitored by installing separate meters and also based on difference between power generated and exported
D.3.3	Power	Power export	kWh	Measured	Continuous	100%	Electronic	Credit period + 2 years	Measured from the tri-vector meter in the sub station
D.3.4	Power	Power import	kWh	Measured	Continuous	100%	Electronic	Credit period + 2 years	Measured from the tri-vector meter in the sub station
D.3.5	Fuel	Biomass used (all types)	MT	Measured	Daily	100%	Paper	Credit period + 2 years	Bunker details during the feed to the boiler.
D.3.6	Fuel	Avg. calorific value of Biomass used	Kcal/Kg	Measured	Monthly	100%	Paper	Credit period + 2 years	Through sample testing in lab
D.3.7	Fuel	Coal	MT	Measured	Daily	100%	Paper	Credit period + 2 years	Bunker details during the feed to the boiler.
D.3.8	Fuel	Carbon content in coal	%	Measured	For each batch of coal	100%	Paper	Credit period + 2 years	Through sample testing in lab once in a year. Proposed to test every batch only if the source



ID number (Please use numbers to ease cross-referencing to table D.6)	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
									of fuel is different.
D.3.9	Fuel	Calorific value of coal	Kcal/Kg	Measured	For each batch of coal	100%	Paper	Credit period + 2 years	Through sample testing in lab once in a year. Proposed to test every batch only if the source of fuel is different.

**D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:**

&gt;&gt;

Data	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.3.1	Low	Generation meter in the control room is calibrated regularly from the authorized laboratory. The readings are continuously monitored and recorded.
D 3.2	Low	Separate energy meters are used to monitor the auxiliary consumption in the plant. In addition, Auxiliary consumption is also compared based on the difference between power generated and power exported.
D.3.3 & D.3.4	Low	Tri-vector meter in the substation which records power export and power import is calibrated once in a year and readings of the same are compared with check meter installed in the plant. Both the meters are calibrated on a regular basis.
D.3.5	Low	Quantity of all types of biomass procured is recorded on a daily basis and it is properly weighed at the entrance of the plant. The weigh bridge is calibrated regularly as per procedures and methodologies established by the Government of India.
D.3.6	Low	The calorific value of the biomass will be measured on a regular basis by a government authorised reputed laboratory.



<i>D.3.7</i>	<i>Low</i>	<i>Quantity of coal is recorded every time a new batch is received. In addition, quantity of coal is recorded whenever coal is used in the power generation in case of contingency.</i>
<i>D.3.8</i>	<i>Low</i>	<i>The carbon content of coal will be measured on a regular basis for every batch of the coal received by a government authorised reputed laboratory.</i>
<i>D.3.9</i>	<i>Low</i>	<i>The calorific value of the coal will be measured on a regular basis for every batch of the coal received by a government authorised reputed laboratory.</i>

The entire process of monitoring will be streamlined soon after the start of plant operations and will be made available in the required format during the verification process and for subsequent useful purposes. As per the monitoring plan, plant monitors electricity generated, exported, imported and auxiliary consumption. In addition, plant monitors fuel Consumption data including both biomass of various types and coal. Both the biomass and coal will be analyzed on regular intervals as per the monitoring plan for their CV, %of carbon and all are being maintained in standard formats. The data formats for CDM have already been finalized and monitoring will be done accordingly to ensure and demonstrate existence of MVP in the plant.

The calibration of monitoring equipment (energy meters) is being maintained as per the requirement of CSEB and the same is being done regularly. Power Generation, Export & Auxiliary Consumption, fuel consumption will be recorded daily and the same will be verified and approved by General Manager of the plant. These records will be sent to Head Office for review by the Director and for corrective actions if necessary



**D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:**

>>

Project proponent will implement the following operational and management structure in order to monitor emission reductions and any leakage effects, generated by the project activity.

Project proponent will form a CDM team/committee comprising of persons from relevant departments, which will be responsible for monitoring of all the parameters mentioned in this section. In the CDM team, a special group of operators will be formed who will be assigned responsibility of monitoring of different parameters and record keeping. On daily basis, the monitoring reports will be checked and discussed.

On weekly basis, these reports will be forwarded at the management level.

**D.6. Name of person/entity determining the monitoring methodology:**

>>

Ecofren Power & Projects Limited, who is a project participant and associated experts.

**SECTION E.: Estimation of GHG emissions by sources:****E.1. Formulae used:**

&gt;&gt;

**E.1.1 Selected formulae as provided in appendix B:**

&gt;&gt;

**E.1.2 Description of formulae when not provided in appendix B:**

&gt;&gt;

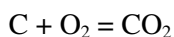
**E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:**

&gt;&gt;

The project proponent, in case of exigencies proposes to use coal (maximum 25% is allowed on annual basis) as fuel instead of biomass. The CO<sub>2</sub> emissions during the usage of coal have been calculated in the following manner:

CO<sub>2</sub> Emission [in kgs]= Stoichiometric CO<sub>2</sub> from carbon content of coal [based on total carbon content ]

To have an estimate of the project CO<sub>2</sub> emission quantity due to combustion of coal along with the biomass, total carbon content of the coal should be known. Combustion reaction for CO<sub>2</sub> emission is as under.



Assuming complete combustion of coal, following formula can be used for conservative estimation of CO<sub>2</sub> emissions.

$$CE_c = (44/12) * C * Q$$

where,

CE<sub>c</sub> - Stoichiometric carbon-dioxide emission due to coal burning at project, MT

C - Carbon percentage in coal, %

Q - Quantity of coal burned, MT

The project emissions due to coal usage have been estimated considering that out of the total power generated 25% will be generated using coal (as maximum usage of coal up to 25% of total fuel consumption is allowed) and equivalent coal quantity is estimated assuming 0.813 kg of coal is required to generate one kWh. However, the actual CERs will be calculated based on the total coal consumption during the operation period using the aforementioned formulae.

The project emissions due to usage of coal are estimated as below:

Coal required to generate one kWh in the plant	:	0.813 kg/kWh
(Assuming plant heat rate of 2600 kcal/kWh and calorific value of coal as 3200 kcal/kg)		
Electricity Generation considered to be produced using coal as fuel	:	25% of total generation



	:	0.25 x 50.79 million kWh
	:	12.69 million kWh
Approximate coal required to generate above power	:	$12.69 \times 10^6 \times 0.813/1000$
	:	10319 tons
% carbon considered in the coal	:	40%
Project emissions due to coal per annum	:	$10319 \times 0.4 \times (44/12)$
(as per formula above)	:	15131 tCO <sub>2</sub> /annum

**E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities**

>>

**(i) Leakage due to transportation of biomass and fly ash**

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:

▪ Biomass to be procured	-	70000 MT
▪ Average Distance between project site and biomass collection centers	-	80 km
▪ Biomass load per truck	-	8 MT
▪ Number of return trips	-	8,750
▪ Consumption of Diesel per trip	-	40 liters (4km/litre)
▪ Total Diesel consumption	-	350,000 liters p.a
▪ CO <sub>2</sub> emission factor for Diesel (as per IPCC guidelines)	-	74.10 tons CO <sub>2</sub> / TJ
▪ CO <sub>2</sub> emission per annum	-	917 tons

The CO<sub>2</sub> emission (leakage) occurs during the transportation of coal from the mines to respective coal based power plant. The distance between the coal mines and the power plants is higher as compared to the transportation distance between biomass collection centers to biomass power project site and hence the higher CO<sub>2</sub> emissions. To be on conservative side, this leakage due to coal transportation has not been added while calculating the baseline of western grid and hence a small leakage due to transportation of biomass has been neglected from the calculations and estimations of emission reductions.

In addition to above, project emissions also occur due to transportation of the fly ash for disposal. Plant may generate around 10000 tons of fly ash per annum. Number of trips to dispose fly ash to destination is estimated around 3 per day. However, the distance of transport of fly ash from the plant to brick manufacturers in the area is well below 100 km and number of truck trips per annum are less than 1500, hence the emissions due to the same have also been neglected.

**(ii) Leakage due to usage of type of fuels**

As per the latest 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	-
<b>Biomass residues or wastes</b>	<b>Biomass residues or wastes are collected and used</b>	-	-	<b>X</b>

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

1. As the project activity uses only rice husk i.e., biomass residues and wastes, the implementation of activity did not lead to shift of pre project activities.
2. Also, the biomass that is being used in the plant is waste that is generated from rice crop. This waste will anyhow be generated even in the absence of the project activity and would have burnt without using 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. The availability of biomass material in the Durg district and nearby areas where plant located is around 435003 MTPA. The total biomass availability in the neighboring



districts where from biomass can be procured is sufficient enough to generate power from the plant without much difficulties. This indicates the abundant availability of the biomass in the region. The quantity of biomass that is available in the region is more than 25% of 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.

### **(iii) Leakage due to import of electricity**

In case of total block out, during emergency and during start up, plant may import some quantity of electricity from grid. Tri vector meter installed in the substation records the amount of electricity imported to the plant from the grid. Such electricity imports results in to leakage due to project activity. However, considering non predictability of quantum of the electricity import from the grid, the emissions from the same are not calculated and hence not included in the calculations. However, plant monitors and maintains the record for the same and emissions due to the same will be calculated and deducted accordingly during verification period.

<b>E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the <u>small-scale project activity emissions</u>:</b>
---

>>

Considering the negligible CO<sub>2</sub> emissions due to leakage due to fuel transportation, these emissions are considered to be zero. However, the emissions from the project using coal as supplementary fuel would be considered for the estimation of net GHG emissions.

<b>E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the <u>baseline</u> using the <u>baseline methodology</u> for the applicable <u>project category</u> in <u>appendix B</u> of the <u>simplified modalities and procedures for small-scale CDM project activities</u>:</b>
--

>>

Western Regional grid is considered for baseline analysis and calculation of anthropogenic emissions by fossil fuels during power generation. It is observed that, in the Western regional grid generation mix, coal based power projects are responsible for GHG emissions. The following scenario of approved methodology has been considered for baseline calculations.



**Scenario: The average of the approximate operating margin and the build margin (Combined margin)**

*Scenario: Combined Margin*

#### a) Operating Margin

The Simple OM emission factor ( $EF_{OM, simple, y}$ ) is calculated as the generation-weighted average emissions per electricity unit (tCO<sub>2</sub>/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM, y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$$

where

- $F_{i,j,y}$  is the amount of fuel  $i$  (in a mass or volume unit) consumed by relevant power sources  $j$  in year(s)  $y$ ,
- $j$  refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports<sup>6</sup> to the grid,
- $COEF_{i,j,y}$  is the CO<sub>2</sub> emission coefficient of fuel  $i$  (tCO<sub>2</sub> / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources  $j$  and the percent oxidation of the fuel in year(s)  $y$ , and
- $GEN_{j,y}$  is the electricity (MWh) delivered to the grid by source  $j$ .

The CO<sub>2</sub> emission coefficient  $COEF_i$  is obtained as

$$COEF_i = NCV_i \cdot EFCO_{2,i} \cdot OXID_i$$

where:

- $NCV_i$  is the net calorific value (energy content) per mass or volume unit of a fuel  $i$ ,
- $OXID_i$  is the oxidation factor of the fuel,
- $EFCO_{2,i}$  is the CO<sub>2</sub> emission factor per unit of energy of the fuel  $i$ .

Where available, local values of  $NCV_i$  and  $EFCO_{2,i}$  are used. If no such values are available, country-specific values are used.

#### (b) Calculation of Build margin emission factor for each source of baseline generation mix

The Build Margin emission factor ( $EF_{BM,y}$ ) is calculated as the generation-weighted average emission factor (tCO<sub>2</sub>/MU) of a sample of power plants



$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_m GEN_{m,y}}$$

Where  $F_{i,m,y}$ ,  $COEF_{i,m}$  and  $GEN_{m,y}$  are analogous to the variables described for the simple OM method above for plants  $m$ .

### (c) Combined Margin Factor

This is calculated as the weighted average of the Operating Margin emission factor ( $EF_{OM,y}$ ) and the Build Margin emission factor ( $EF_{BM,y}$ ):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$

where the weights  $w_{OM}$  and  $w_{BM}$ , by default, are 50% (i.e.,  $w_{OM} = w_{BM} = 0.5$ ), and  $EF_{OM,y}$  and  $EF_{BM,y}$  are calculated as described in Steps 1 and 2 above and are expressed in tCO<sub>2</sub>/MWh

Final (net) baseline emission factor (NEFB) = 0.819

### (d) Power Export by project activity

$$TP_{exp} = TP_{gen} - TP_{aux} - TP_{loss}$$

Where

$TP_{gen}$	Total power generated
$TP_{exp}$	Total clean power export to grid per annum
$TP_{aux}$	Total auxiliary consumption of plant per annum
$TP_{loss}$	T&D loss

### (e) Emission reduction by project activity

$$ER = TP_{exp} \times (NEF_B - NEF_p) - EL$$

Where

ER	Emission reduction per annum by project activity (tonnes/year)
$TP_{exp}$	Total clean power export to grid per annum
$NEF_B$	Final emission factor of baseline
$NEF_p$	Net emission factor of project activity (=0)
EL	Emission leakage (tonnes/year) (= 0)



Since there is a gap between demand and supply in Western grid, the export of power from the project activity to Chhattisgarh grid will replace or get absorbed to partially fulfill the regional power requirement.

If the same amount of electricity is generated by the coal based power project mix, it adds to the emissions that are getting reduced by the project activity. Hence, the baseline calculated using above methods / scenarios would represent the realistic anthropogenic emissions by sources that would occur in absence of the project activity.

**E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:**

>>

Following formula is used to determine Emission reduction

<b>CO<sub>2</sub> emission reduction due to project activity</b>	=	Net CO <sub>2</sub> baseline emission x Electricity exported to grid (in kWh)	-	Project emission
	=	366188	-	151308
	=	214880		

**E.2 Table providing values obtained when applying formulae above:**

>>

	Operating Years	Baseline Emissions (tonnes of CO <sub>2</sub> )	Project Emissions <sup>9</sup> (tonnes of CO <sub>2</sub> )	Certified Emission Reductions (tonnes of CO <sub>2</sub> )
1.	2007-08	36619	15131	21488
2.	2008-09	36619	15131	21488
3.	2009-10	36619	15131	21488
4.	2010-11	36619	15131	21488
5.	2011-12	36619	15131	21488
6.	2012-13	36619	15131	21488
7.	2013-14	36619	15131	21488
8.	2014-15	36619	15131	21488
9.	2015-16	36619	15131	21488
10.	2016-17	36619	15131	21488
	<b>Total</b>	<b>366188</b>	<b>151308</b>	<b>214880</b>

Therefore, conventional energy equivalent of 446.94 Million kWh for a period of 10 years in Chhattisgarh would be saved by exporting power from the 8 MW Biomass based power plant which in turn will reduce 214,880 tons of CO<sub>2</sub> emissions considering baseline calculations.

Baseline data used for the calculation is provided in Annex-3 and the detailed calculation using the formulae is presented in an Enclosure – I to this PDD.

<sup>9</sup> Estimated based on 30% power generation using coal as supplementary fuel over the credit period

**SECTION F.: Environmental impacts:****F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:**

&gt;&gt;

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 dated June 13, 2002 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 crores have been excluded from the list. Hence, it is not required by the host party.

The project has taken all the care to follow the rules and regulations for conservation of the environment prescribed by licensing authorities like CECB.

**SECTION G. Stakeholders' comments:****G.1. Brief description of how comments by local stakeholders have been invited and compiled:**

&gt;&gt;

The local stakeholder comment invitation and compilation process involved is as follows:

The local stakeholders are immediately affected by the activities of the project. The effect is on the local environment, social life and economics. All the individuals and organizations falling in the above effects are perceived as stakeholders. They can be within the boundaries of the village, district, state or nation.

On deciding above criteria for qualification of the stakeholders, the idea was to decide most appropriate representatives who are covering above. During interaction of the corporate headquarter and the plant management, the stakeholders were identified as:

- Office bearers of the Chandkhuri village, Block Durg
- Office bearers of the neighboring village's local bodies
- Authorities of the District local administration
- Biomass suppliers
- Customer (CSEB)
- Licensing and regulatory authorities like
  - CREDA
  - CECB

EPPL has been constantly in touch with all above mentioned stakeholders and other identified stakeholders like licensing and regulatory authorities. Their views are reflected in the form of permissions granted for the project. In this aspect, the permission by CREDA, MoEF, CECB and MNES are indication of favorable impression for the project.



EPPL invited the local stakeholder for providing them the feedback on the project activity by inviting them to a stakeholder meeting conducted at the plant premises. The local stakeholders involved the village gram panchayat office bearers and general population and officials from the State Pollution Control Board, Electricity Board and CREDA. The stakeholders were asked to provide their general feedback on the project activity and how the project activity would help the local people in improving employment and business opportunities in the area.

### Stakeholders Involvement

The village *Panchayat* /local elected body of representatives administering the local area is a true representative of the local population in a democracy like India. Hence, their consent / permission to set up the project is necessary. EPPL has already completed the necessary consultation and documented their approval for the project.

Local population comprises of the local people in and around the project area. The local rice mill owners and farmers will be involved in the supply of the biomass and hence the project would be a beneficial project for these stakeholders. In addition to this, the project would also lead to local manpower working at the plant site. Since, the project will provide good direct and indirect employment opportunities the local populace is encouraging the project.

The project does not require displacement of any local population. In addition, the local population is also an indirect consumer of the power that is supplied from the power plants.

The distance between the electrical substation for power evacuation and the plant is around 5 km only hence installation of transmission lines will not create any inconvenience to the local population.

Chhattisgarh Environment Conservation Board (CECB) has prescribed standards of environmental compliance and monitors the adherence to the standards. The project has already received No Objection Certificate (NOC) from CECB to start the plant.

Chhattisgarh State Renewable Energy Development Agency (CREDA) implements policies in respect of non-conventional renewable power projects in the state of Chhattisgarh and has accorded approval to the project vide letter no.7126/CREDA/Biomass/RSB/2003-04 dated 02<sup>nd</sup> January 2004, no. 8070/CREDA/BM/RSB/2003-04 dated 18<sup>th</sup> March 2004 and No. 1508/CREDA/BM/RSB/2005-06 dated 11<sup>th</sup> July 2005.

As a buyer of the power, the CSEB is a major stakeholder in the project. They hold the key to the commercial success of the project. CSEB has already cleared the project and EPPL has already signed Power Purchase Agreement (PPA) with CSEB vide letter no 02-02/SE-I/12/107-01/1059 dated 2<sup>nd</sup> August 2004.

The government of India, through Ministry of Non-conventional Energy Sources (MNES), has been promoting energy conservation, demand side management and viable renewable energy projects including wind, small hydro and bagasse cogeneration / bio-mass power. The project meets their requirements.

**G.2. Summary of the comments received:**

&gt;&gt;

As mentioned above, EPPL has already received the approvals and clearances for their project from the following stakeholders:

- Consent order of Establishment from CECB
- Power Purchase Agreement with CSEB;
- Clearance from the Gram Panchayat, Kurd block

Although, in India, public participation at any stage of project implementation is not required, being a CDM activity, project proponent has invited the local stakeholders including Sarpanch (head) of village, representative of local population and biomass suppliers (Rice mill owners) to express their views on the project and the summary is presented as below.

Village Sarpanch and biomass suppliers expressed their eagerness to witness the complete benefits due to the project in future and expressed their happiness about the implementation of project in his village. Though it is very early to comment on full benefits from the project as the plant has just started its operations, they expressed their hope that the project activity will further create employment opportunities for the villagers in addition to the present and also for creating an additional means of revenue for rice mill owners /local farmers. Villagers expressed their happiness that they get reasonable monetary gains for harvesting the available biomass and supplying it to project activity.

Representative rice mill owners also expressed their happiness about project implementation by EPPL in this area. They expressed their hope that the project will provide them more opportunities of small business. They mentioned that it provides employment for local labors, skilled and unskilled workers and prevent their transfer to nearby cities. They further added that, the project activity can definitely provide business opportunity for local transporters also.

In summary, every stakeholder expressed that the project activity is helping the socio-economic development of the village and nearby area without affecting the local environment adversely.

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

&gt;&gt;

The relevant comments and important clauses mentioned in the project documents like Detailed Project Report (DPR), environmental clearances, power purchase agreement, local clearance etc. were considered while preparation of CDM project development document.

Further, the document will be published on UNFCCC/Validator's website for public comments.

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

Organization:	Ecofren Power & Projects Ltd
Street/P.O.Box:	6-3-248/G/A/1, Road No. 1
Building:	Banjara Hills,
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500 034
Country:	India
Telephone:	91-40-2330 3399
FAX:	91-40-2337 8999
E-Mail:	<a href="mailto:ecofren@rediffmail.com">ecofren@rediffmail.com</a>
URL:	
Represented by:	
Title:	Mr.
Salutation:	
Last Name:	Reddy
Middle Name:	Rami
First Name:	Venkata
Department:	Director
Mobile:	
Direct FAX:	91-40-2330 3399
Direct tel:	91- 40-2337 8999
Personal E-Mail:	



Annex 2

**INFORMATION REGARDING PUBLIC FUNDING**

No Public Funding Available For This Project

**Annex-3****BASE LINE DATA**

The methodology adopted for the calculation of the baseline is ‘the combined margin emissions of the current generation mix’. Western Grid generation data as tabulated below is used for consideration of installed western grid capacity and energy availability.

In order to arrive at the detailed break up of power generation mix in Western Region, various documents and various web sites were referred. The websites referred for estimating the generation mix in western regional grid are:

<b>Data</b>	<b>Source of data</b>
Power Plant Details in Western Regional Grid and their commissioning dates	<ul style="list-style-type: none"> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=1">http://www.gseb.com/uh.php?PowerStationID=1</a></li> <li>- <a href="http://www.cea.nic.in/opt1_design_engg_hydro.pdf">http://www.cea.nic.in/opt1_design_engg_hydro.pdf</a></li> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=8">http://www.gseb.com/uh.php?PowerStationID=8</a></li> <li>- <a href="http://www.gseb.com/gerc_index.htm">http://www.gseb.com/gerc_index.htm</a></li> <li>- WREB Annual Report (2004-2005) Annex-VII</li> <li>- <a href="http://www.cea.nic.in/opm/anu0001/SEC10.pdf">http://www.cea.nic.in/opm/anu0001/SEC10.pdf</a></li> <li>- CEA General Review (2005):Table No. 2.7</li> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=7">http://www.gseb.com/uh.php?PowerStationID=7</a></li> <li>- CEA: Performance Review (2004-2005):Section 10</li> <li>- <a href="http://www.tce.co.in/brochures/Ccpp/ccppa4.pdf">http://www.tce.co.in/brochures/Ccpp/ccppa4.pdf</a></li> <li>- <a href="http://www.gipcl.com/">http://www.gipcl.com/</a></li> <li>- <a href="http://www.essar.com/power/plants.htm">http://www.essar.com/power/plants.htm</a></li> <li>- <a href="http://www.clpgroup.com/">http://www.clpgroup.com/</a></li> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=2">http://www.gseb.com/uh.php?PowerStationID=2</a></li> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=9">http://www.gseb.com/uh.php?PowerStationID=9</a></li> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=3">http://www.gseb.com/uh.php?PowerStationID=3</a></li> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=4">http://www.gseb.com/uh.php?PowerStationID=4</a></li> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=5">http://www.gseb.com/uh.php?PowerStationID=5</a></li> <li>- <a href="http://www.gseb.com/uh.php?PowerStationID=6">http://www.gseb.com/uh.php?PowerStationID=6</a></li> <li>- WREB Annual Report (2004-2005): Annex-VII</li> <li>- <a href="http://www.torrentpower.com/investors/inv_cp_hd.php">http://www.torrentpower.com/investors/inv_cp_hd.php</a></li> <li>- <a href="http://www.gipcl.com/">http://www.gipcl.com/</a></li> <li>- <a href="http://www.mperc.org/mppower1.html">http://www.mperc.org/mppower1.html</a></li> <li>- <a href="http://www.mperc.org/mppower1.html">http://www.mperc.org/mppower1.html</a></li> <li>- CEA General Review (2005):Table No. 2.7</li> <li>- <a href="http://www.mperc.org/mppower1.html">http://www.mperc.org/mppower1.html</a></li> <li>- <a href="http://www.cseb-powerhub.com/generation.htm">http://www.cseb-powerhub.com/generation.htm</a></li> </ul>



	<ul style="list-style-type: none"> <li>- <a href="http://www.mahagenco.in/genstats/gg99.shtm">http://www.mahagenco.in/genstats/gg99.shtm</a></li> <li>- <a href="http://www.mahagenco.in/genstats/gg98.shtm">http://www.mahagenco.in/genstats/gg98.shtm</a></li> <li>- <a href="http://www.mahagenco.in/genstats/gg100.shtm">http://www.mahagenco.in/genstats/gg100.shtm</a></li> <li>- <a href="http://www.mahagenco.in/genstats/gg99.shtm">http://www.mahagenco.in/genstats/gg99.shtm</a></li> <li>- <a href="http://www.rel.co.in/aboutus/GoaPower.asp">http://www.rel.co.in/aboutus/GoaPower.asp</a></li> <li>- <a href="http://www.ntpc.co.in/powerplants/ntpc_pw_kawas.shtml">http://www.ntpc.co.in/powerplants/ntpc_pw_kawas.shtml</a></li> <li>- <a href="http://www.ntpc.co.in/powerplants/ntpc_pw_Jhanor.shtml">http://www.ntpc.co.in/powerplants/ntpc_pw_Jhanor.shtml</a></li> <li>- <a href="http://www.ntpc.co.in/powerplants/ntpc_pw_korba.shtml">http://www.ntpc.co.in/powerplants/ntpc_pw_korba.shtml</a></li> <li>- <a href="http://www.ntpc.co.in/powerplants/ntpc_pw_vindhyachal.shtml">http://www.ntpc.co.in/powerplants/ntpc_pw_vindhyachal.shtml</a></li> <li>- <a href="http://www.dae.gov.in/taps.htm">http://www.dae.gov.in/taps.htm</a></li> <li>- <a href="http://www.dae.gov.in/kapp.htm">http://www.dae.gov.in/kapp.htm</a></li> </ul>
Generation, calorific value of fuels and fuel consumption details	CEA Annual Report 2002-03, 2004-05 WREB annual report 2004-05
Emission factors for other regions	<a href="http://www.mnes.nic.in">www.mnes.nic.in</a>
Oxidation factors and emission factor of fuels	IPCC default values

The baseline emission factor for the project activity is calculated as per the procedures prescribed in the latest version of the approved methodology ACM0002 (Version 06) as suggested in AMS I.D Paragraph 9.

### **Combined Margin**

The approved consolidated baseline methodology suggests that the project activity would have an effect on both the operating margin (*i.e.* the present power generation sources of the grid, weighted according to the actual participation in the state grid mix) and the build margin (*i.e.* weighted average emissions of recent capacity additions) of the selected Western Regional Grid and the net baseline emission factor would therefore incorporate an average of both these elements.

### **Step 1: Calculation of Operating Margin**

As mentioned above the proposed project activity would have some effect on the Operating Margin (OM) of the Western Regional Grid. The approved consolidated baseline methodology-AMS I.D requires the project proponent to calculate the Operating Margin (OM) emission factor following the guidelines in ACM0002 (Consolidated methodology for grid-connected electricity generation from renewable sources).



As per Step 1 of ACM0002, the Operating Margin emission factor(s) ( $EF_{OM,y}$ ) is calculated based on one of the four following methods:

- a) Simple OM, or
- b) Simple adjusted OM, or
- c) Dispatch Data Analysis OM, or
- d) Average OM.

The baseline adopted for the project activity, which is the Western Regional Grid was found to be dominated by fossil fuel based power plants. The low operating cost and must run resources which typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation constituted less than 50% of the total grid generation.

As per the methodology, ‘Dispatch Data Analysis’ (1c) is the first methodological choice. However, this method is not selected for OM emission factor calculations, as the share of low cost / must run resources of the selected grid over the past three years (2002-03 to 2004-05) has been found to be less than 50% of the gross grid generation. This meets the condition as stipulated by the selected methodology, for using the simple OM method for calculating the operating margin emission factor as against the dispatch analysis method.

‘Simple OM’ (1a) method is applicable to project activity connected to the project electricity system (grid) where the low-cost/must run<sup>10</sup> resources constitute less than 50% of the total grid generation in

- 1) Average of the five most recent years, or
- 2) Based on long-term normal for hydroelectricity production.

The Simple adjusted OM (1b) and Average OM (1d) methods are applicable to project activity connected to the project electricity system (grid) where the low-cost/must run resources constitute more than 50% of the total grid generation. To select the appropriate methodology for determining the Operating Margin emission factor ( $EF_{OM,y}$ ) for the project activity, project proponent conducted a baseline study wherein the power generation data for all power sources in the project electricity system (i.e. Western Regional Grid) have been collected from government/non-government organizations and authentic sources. The power generation mix of Western Regional Grid comprises of coal, gas and diesel based thermal power generation and hydro, wind and nuclear power generation. The actual generation data of entire Western Regional Grid is analyzed for the years 2002-2003, 2003-2004 and 2004-2005 to arrive at the contribution of the thermal power plants and the low-cost and must run power generation sources in the Western Regional Grid mix. It was found that the average share of the low cost and must run power generation sources over the three most recent years was lower than 50% of the total electricity generation in the grid.

---

<sup>10</sup> The low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.



Project proponent has therefore adopted the ‘Simple OM’ (1a) method, amongst the ‘Simple OM’ (1a), ‘Simple adjusted OM’ (1b) and ‘Average OM’ (1d) methods to calculate the Baseline Emission Factor of the chosen grid.

The Simple OM, simple-adjusted OM, and average OM emission factors can be calculated using either of the two following data vintages for years(s)  $y$ :

- (*ex-ante*) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- the year in which project generation occurs, if  $EF_{OM,y}$  is updated based on *ex-post* monitoring.

Project proponent has calculated the OM emission factor as per the 3-year average of Simple OM calculated based on the most recent statistics available at the time of PDD submission. PP has chosen this method to fix the simple OM (*ex ante*) for the entire crediting period.

The Simple OM emission factor ( $EF_{OM,simple,y}$ ) is calculated as the generation-weighted average emissions per electricity unit (tCO<sub>2</sub>/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$$

where  $F_{i,j,y}$  is the amount of fuel  $i$  (in a mass or volume unit) consumed by relevant power sources  $j$  in year(s)  $y$ ,

$j$  refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports<sup>6</sup> to the grid,

$COEF_{i,j,y}$  is the CO<sub>2</sub> emission coefficient of fuel  $i$  (tCO<sub>2</sub> / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources  $j$  and the percent oxidation of the fuel in year(s)  $y$ , and

$GEN_{j,y}$  is the electricity (MWh) delivered to the grid by source  $j$ .

The CO<sub>2</sub> emission coefficient  $COEF_i$  is obtained as

$$COEF_i = NCV_i \cdot EFCO_{2,i} \cdot OXID_i$$

where:

$NCV_i$  is the net calorific value (energy content) per mass or volume unit of a fuel  $i$ ,

$OXID_i$  is the oxidation factor of the fuel (Referred page 1.29 in the 1996 Revised IPCC Guidelines for default values),

$EFCO_{2,i}$  is the CO<sub>2</sub> emission factor per unit of energy of the fuel  $i$ .

Where available, local values of  $NCV_i$  and  $EFCO_{2,i}$  are used. If no such values are available, country-specific values are used.



As per the availability, actual generation figures as against the sector wise installed capacity were used. Wherever the break up of generation was not available, proportionate calculated figures were used so as to match the total energy availability.

Generation Mix						
Sector	MU	%	MU	%	MU	%
Thermal Coal Based-Western Region	129253.12	78.47	128817.10	76.17	130461.68	75.97
Thermal Diesel Based-Western Region	0.00	0.00	0.00	0.00	0.00	0.00
Thermal Gas Based-Western Region	18388.84	11.16	21051.40	12.45	25272.47	14.72
Hydro-Western Region	8121.76	4.93	9226.42	5.46	10523.76	6.13
Wind-Western Region	878.52	0.53	1521.76	0.90	0.00	0.00
Nuclear-Western Region	5600.00	3.40	5305.74	3.14	4496.51	2.62
Import from Self Generating Industries	2467.87	1.50	3196.81	1.89	978.14	0.57
<b>Total</b>	<b>164710.11</b>	<b>100.00</b>	<b>169119.23</b>	<b>100.00</b>	<b>171732.56</b>	<b>100.00</b>
Total generation excluding Low-cost power generation	147641.96		149868.50		155734.15	
Generation by Coal out of Total Generation excluding Low-cost power generation	129253.12	87.54	128817.10	85.95	130461.68	83.77
Generation by Diesel out of Total Generation excluding Low-cost power generation	0.00	0.00	0.00	0.00	0.00	0.00
Generation by Gas out of Total Generation excluding Low-cost power generation	18388.84	12.46	21051.40	14.05	25272.47	16.23
<b>Imports from others</b>						
Imports from NREB	1124.49		1137.41		1093.26	
Imports from SREB	466.82		0.00		1766.61	
Imports from EREB	257.20		1450.41		9094.76	

Estimation of Baseline Emission Factor (tCO <sub>2</sub> /MU)						
<b>Simple Operating Margin</b>						
<b>Fuel 1 : Coal</b>						
Avg. Calorific Value of Coal used (kcal/kg)		4171		3820		3820
Actual Coal consumption (tons/yr)		88509000		88951000		91786000
Emission Factor for Coal-IPCC standard value (tonne CO <sub>2</sub> /TJ)		96.1		96.1		96.1
Oxidation Factor of Coal-IPCC standard value		0.98		0.98		0.98
COEF of Coal (tonneCO <sub>2</sub> /ton of coal)		1.645		1.506		1.506
<b>Fuel 2 : Diesel</b>						
Avg. Efficiency of power generation with diesel as a fuel, %		41.707		41.707		41.707
Avg. Calorific Value of Diesel used (kcal/kg)		9760		10186		10186
Estimated Diesel consumption (tons/yr)		0		6115		6115
Emission Factor for Diesel-IPCC standard value (tonne CO <sub>2</sub> /TJ)		74.1		74.1		74.1
Oxidation Factor of Diesel-IPCC standard value		0.99		0.99		0.99
COEF of Diesel (tonneCO <sub>2</sub> /ton of diesel)		2.998		3.129		3.129
<b>Fuel 3 : Gas</b>						



Avg. Efficiency of power generation with gas as a fuel, %		45		45		45
Avg. Calorific Value of Gas used (kcal/kg)		11942		11942		11942
Estimated Gas consumption (tons/yr)		2942817		3368913		4044423
Emission Factor for Gas- IPCC standard value(tonne CO2/TJ)		56.1		56.1		56.1
Oxidation Factor of Gas-IPCC standard value		0.995		0.995		0.995
COEF of Gas(tonneCO2/ton of gas)		2.791		2.791		2.791
EF (OM Simple, excluding imports from other grids), tCO2/MU		1041.62		956.91		960.39
EF (NREB), tCO2/MU		790.00		740.00		730.00
EF (SREB), tCO2/MU		770.00		760.00		740.00
EF (EREB), tCO2/MU		1190.00		1190.00		1180.00
EF (OM Simple), tCO2/MU		1039.13		957.51		968.48
3 years Average EF (OM Simple), tCO2/MU						988.37

## Step 2: Calculation of Build Margin

As mentioned above the proposed project activity would have some effect on the Build Margin (BM) of the Western Regional Grid. The approved consolidated baseline methodology-AMS I.D requires the project proponent to calculate the Build Margin (BM) emission factor following the guidelines in ACM0002 (Consolidated methodology for grid-connected electricity generation from renewable sources).

As per Step 2 of ACM0002, the Build Margin emission factor ( $EF_{BM,y}$ ) is calculated as the generation-weighted average emission factor (tCO<sub>2</sub>/MU) of a sample of power plants.

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_m GEN_{m,y}}$$

where  $F_{i,m,y}$ ,  $COEF_{i,m}$  and  $GEN_{m,y}$  are analogous to the variables described for the simple OM method above for plants  $m$ .

The methodology suggests the project proponent to choose one of the two options available to calculate the Build Margin emission factor  $EF_{BM,y}$

**Option 1:**

Calculate the Build Margin emission factor  $EF_{BM,y}$  *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 either:

- (a) The five power plants that have been built most recently, or
- (b) The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MU) and that have been built most recently.

Project participants should use from these two options that sample group that comprises the larger annual generation.

**Option 2:**

For the first crediting period, the Build Margin emission factor  $EF_{BM,y}$  must be updated annually *ex post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods,  $EF_{BM,y}$  should be calculated *ex-ante*, as described in Option 1 above. The sample group  $m$  consists of either

- (a) the five power plants that have been built most recently, or
- (b) the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MU) and that have been built most recently.

Project participants should use from these two options that sample group that comprises the larger annual generation.

Project proponent has adopted the Option 1, which requires the project participant to calculate the Build Margin emission factor  $EF_{BM,y}$  *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  $m$  should consist of either:

- (a) the five power plants that have been built most recently, or
- (b) the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MU) and that have been built most recently.

Project participants are required to use from these two options that sample group that comprises the larger annual generation. As per the baseline information data the option (b) comprises the larger annual generation. Therefore for the project activity the sample group  $m$  consists of (b) the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MU) and that have been built most recently. Power plant capacity additions registered as CDM project activities are excluded from the sample group.



Considering 20% of Gross Generation						
Sector	MU	%	MU	%	MU	%
Thermal Coal Based-Western Region					21298.88	49.37
Thermal Diesel Based-Western Region					6115.00	14.17
Thermal Gas Based-Western Region					9816.20	22.75
Hydro-Western Region					4804.29	11.14
Wind-Western Region					0.00	0.00
Nuclear-Western Region					1106.27	2.56
Import from other Regions					0.00	0.00
Import from Self Generating Industries					0.00	0.00
<b>Total</b>					43140.64	100.00
Generation by Coal out of Total Generation					21298.88	49.37
Generation by Diesel out of Total Generation					6115.00	14.17
Generation by Gas out of Total Generation					9816.20	22.75
<b>Built Margin</b>						
<b>Fuel 1 : Coal</b>						
Avg. efficiency of power generation with coal as a fuel, %						36.487
Avg. calorific value of coal used in UPPCL, kcal/kg						3820
Estimated coal consumption, tons/yr						13141742
Emission factor for Coal (IPCC),tonne CO2/TJ						96.1
Oxidation factor of coal ( IPCC standard value)						0.98
COEF of coal (tonneCO2/ton of coal)						1.506
<b>Fuel 2 : Diesel</b>						
Avg. Efficiency of power generation with diesel as a fuel, %						41.707
Avg. Calorific Value of Diesel used (kcal/kg)						10186
Estimated Diesel consumption (tons/yr)						1237888
Emission Factor for Diesel-IPCC standard value (tonne CO2/TJ)						74.1
Oxidation Factor of Diesel-IPCC standard value						0.99
COEF of Diesel (tonneCO2/ton of diesel)						3.129
<b>Fuel 3 : Gas</b>						
Avg. Efficiency of power generation with gas as a fuel, %						45
Avg. Calorific Value of Gas used (kcal/kg)						11942
Estimated Gas consumption (tons/yr)						1570914
Emission Factor for Gas- IPCC standard value(tonne CO2/TJ)						56.1
Oxidation Factor of Gas-IPCC standard value						0.995
COEF of Gas(tonneCO2/ton of gas)						2.791
<b>EF (BM) (tCO2/MU)</b>						<b>650.27</b>

**STEP 3. Calculate the baseline emission factor  $EF_y$  as the weighted average of the Operating Margin emission factor ( $EF_{OM,y}$ ) and the Build Margin emission factor ( $EF_{BM,y}$ ):**

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$



where the weights  $w_{OM}$  and  $w_{BM}$ , by default, are 50% (i.e.,  $w_{OM} = w_{BM} = 0.5$ ), and  $EF_{OM,y}$  and  $EF_{BM,y}$  are calculated as described in Steps 1 and 2 above and are expressed in tCO<sub>2</sub>/MWh.

Project Participant adopted the guidance provided on the selection of default weightings of OM & BM to calculate CM, i.e, 0.5 for OM & 0.5 for BM as applicable for biomass renewable project. The guidance provides a number of project-specific and context-specific factors for developing alternative operating and build margin weights to the defaults mentioned. It does not, however, provide specific algorithms to translate these factors into quantified weights, nor does it address all factors that might conceivably affect these weights. In those cases, project participants are suggested (according to Review Comments) to propose specific quantification methods with justifications that are consistent with the guidance provided. It is also mentioned that under circumstances where it is unlikely that a project will impact either the OM or BM exclusively during the first crediting period, it is suggested that neither weight exceed 75% during the first crediting period. PP opted for fixed crediting period. As the project activity capacity is just 8 MW and it is very unlikely to affect BM during entire crediting period and also in the context of non availability of specific algorithms to translate affects of above mentioned factors into quantified weights, 50/50 default weights are considered for OM and BM to calculate combined margin.

Combined Margin Factor (Avg of OM & BM) (tCO <sub>2</sub> /MU)	819.32
Baseline Emissions Factor (tCO <sub>2</sub> /MU)	819.32



#### **Annex 4 Monitoring Plan**

All the parameters mentioned in the monitoring plan will be monitored in the plant in standard formats. The entire process of monitoring will be streamlined from the beginning of plant operations and will be made available in the required format during the verification process and for subsequent useful purposes. The Fuel Consumption data, etc are being maintained in standard formats. The data formats for CDM have already been finalized and will be monitored accordingly to ensure and demonstrate existence of MVP in the plant.

The calibration of monitoring equipment will be maintained as per the requirement of CSEB. Power Generation, Export & Auxiliary Consumption, fuel consumption will be recorded daily and the same is verified and approved by General Manager of the plant. These records will be sent to Head Office for review by the Director and for corrective actions if necessary.

Further, Internal Auditors also will verify the monitoring data. As per the advices of the Internal Audit team, corrective actions will be taken up for more accurate future monitoring and reporting system.

The Plant is equipped with energy meters/export meters for monitoring and control purpose. There are two energy meters at CSEB sub station to measure the export power, namely main meter and check meter with desired accuracy. The energy meters shall be tested and calibrated utilizing a standard meter. The standard meter shall be calibrated once in a year at the approved laboratory of Govt. of India or Govt. of Chattisgarh as per terms and conditions of supply. The tests of meters shall 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 shall not be interfered with, tested or checked except in the presence of representatives of company and CSEB. 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 shall 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 shall be as per the replaced meter. Corrections in exported energy shall be applicable to the period between the two previous monthly reading and the date and time of test calibration in the current month when error is observed.

Power generation, export and auxiliary consumption will be recorded at the plant from the installed meters. However, for applying monthly bill to CSEB the meter readings will be taken on pre decided



dates of every month by CSEB officials in presence of company representatives and readings will be jointly certified.

The following log sheets will be maintained for the critical equipment of the plant and readings will be recorded on day to day basis:

1. Turbine log
2. Boiler log
3. Electrical log

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.

Power generation, export and auxiliary consumption, fuel consumption are being recorded at the plant daily and the same is being verified by Manager of the plant. These records will be sent to head office for review by the director and for corrective actions if necessary. Plant also records electricity imports from the grid once in a month based on the tri vector meter readings installed in the sub station.

Usage of auxiliary fuel i.e. coal in the boiler will also be monitored and recorded when ever the same is being used. Plant also maintains the receipts of coal procurement, weigh bridge slips and invoices made to the suppliers to check the coal receipts and consumption in the plant. Coal consumption in the plant can be verified through following means:

1. Cross checking receipts for inputs (both coal and rice husk) against electricity generated
2. Random checks by the verifier
3. Invoices from the coal suppliers
4. Allotment letter, if any from authorized organization on quantity of coal that can be used in the plant during that year

All the required documentation for the verification of coal consumption in the plant through any of the above mentioned ways will be maintained and are made available to the verifier during verification.



Overall, the following parameters will be monitored in the plant:

<b>Parameter</b>	<b>Monitoring Method</b>	<b>Verification Method</b>
Electricity Generated	Using electricity meter installed in the control room	Plant records
Electricity exported	Using Tri-vector meter installed in the sub station	CSEB reports, joint meter readings
Electricity imported	Using Tri-vector meter installed in the sub station	CSEB reports, joint meter readings
Auxiliary consumption	Based on the difference between electricity generated and electricity exported	Plant records and joint meter readings
Biomass consumption (of all kinds)	Weigh bridge receipts, invoices made to the suppliers, yard register, bunker levels	Weigh bridge receipts, invoices made to the suppliers, yard register
Calorific value of fuels (all kinds)	Sample testing in the laboratory	Lab reports
Coal consumption	Invoices from the coal suppliers; Weighbridge slips, bunker levels	Cross checking receipts for inputs (both coal and rice husk) against electricity generated; Allotment letter, if any from authorized organization on quantity of coal that can be used in the plant during that year
Carbon content in coal	Sample testing in the laboratory	Lab reports
Calorific value of coal	Sample testing in the laboratory	Lab reports

Emission levels will be monitored as per the statutory requirement. Plant emission levels will be monitored and the results will be sent to CECB. For this purpose, the service of external agency will be utilized.



**Appendix A**  
Abbreviations

CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CECB	Chhattisgarh Environment Conservation Board
CER	Certified Emission Reductions
CREDA	Chhattisgarh State Renewable Energy Development Agency
CSEB	Chhattisgarh State Electricity Board
Cm	Centimeter
CO <sub>2</sub>	Carbon Dioxide
DPR	Detailed Project Report
EPPL	Ecofren Power & Projects Limited
FBC	Fluidized Bed Combustion
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
IREDA	India Renewable Energy Development Agency
Kcal	Kilo Calories
Kg	Kilogram
KM	Kilometer
KP	Kyoto Protocol
KW	Kilowatt
KV	Kilovolts
kWh	Kilowatt hour
LP	Low Pressure
MNES	Ministry of Non-Conventional Energy Sources
MoEF	Ministry of Environment and Forests
MT	Metric Tons
MU	Million Units
MW	Megawatt
NOC	No Objection Certificate
p.a	Per annum
PDD	Project Design Document
PIN	Project Idea Note
PLF	Plant Load Factor
PPA	Power Purchase Agreement
RE	Renewable Energy
SEB	State Electric Board
STG	Steam Turbine Generator



T&D	Transmission and Distribution
TJ	Tera Joules
UNFCCC	United Nations Framework Convention on Climate Change



**Appendix B**  
REFERENCE LIST

<b>Sr. No</b>	<b>References</b>
1.	Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) <a href="http://cdm.unfccc.int">http://cdm.unfccc.int</a>
2.	Website of United Nations Framework Convention on Climate Change, <a href="http://unfccc.int">http://unfccc.int</a>
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: Annx B to attachment 3, Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories
5.	Detailed project report on 8 MW Biomass based power project – Ecofren Power & projects Limited
6.	Website of Central Electric Authority (CEA), Ministry of Power, Govt. of India- <a href="http://cea.nic.in">http://cea.nic.in</a>
7.	CEA published document “16 <sup>th</sup> Electric Power Survey of India”
8.	Website of CSEB, <a href="http://www.cseb-powerhub.com">www.cseb-powerhub.com</a>
9.	Website of Ministry Non-Conventional Energy Sources (MNES), Government of India, <a href="http://mnes.nic.in">http://mnes.nic.in</a>
10.	Website of Indian Renewable Energy Development Agency (IREDA), <a href="http://ireda.nic.in">http://ireda.nic.in</a>
11.	Website of Climate Change Cell, Ministry of Environment & Forest, Govt. of India. <a href="http://envfor.nic.in">http://envfor.nic.in</a>

- - - - -

