Project design document form

(Version 11.0)

BASIC INFORMATION	
Title of the project activity	9MW Biomass Power Project at Yedlapur Village in Raichur District, Karnataka, India
Scale of the project activity	☐Large-scale ☒Small-scale
Version number of the PDD	4
Completion date of the PDD	28/01/2021
Project participants	M/s Raichur Bioenergies Private Limited
Host Party	India
Applied methodologies and standardized baselines	Methodology: AMS.I.D." Grid connected renewable electricity generation" Version 17. Standardized baselines – Not Applicable
Sectoral scopes	01 Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	40,540 t CO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity is a 9MW Biomass Power Project located near Yedlapur Village in Raichur District of Karnataka, India being implemented by M/s Raichur Bioenergies Private Limited (RBPL).

The project of biomass based power generation mainly consists of burning available biomass like Rice husk obtained from rice mills in the region effectively for generation of electricity. The electricity thus generated is being sold to southern grid for revenue generation, sustainable economic growth, conservation of environment through use of green fuels (rice husk in this instance) and Green House Gas (GHG) emission reduction.

Raichur has over 100 rice mills producing large quantity of paddy-husk as by-product. Husk from rice mill for power generation offers a number of advantages both to the users and to the country. Apart from helping in bridging the gap between the demand and supply in the power sector, the "Husk Power" offers an environmentally friendly solution for additional power generation that helps in saving the fossil fuels and improves the financial position of the industry. The project is fully commissioned on 01/02/2016.

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

Measures taken up to promote Sustainable Development

Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India (GoI) has the prerogative to confirm whether the project meets the stipulated criteria in achieving sustainable development for issuing host country approval to Clean Development Mechanism (CDM) projects.

During the development and subsequent operational stages of the project activity, RBPL has ensured that all project related tasks are carried out in a sustainable manner. In this regard, MoEFCC has stipulated Social well-being, Economic well-being, Environmental well-being and Technological well-being as the four indicators to evaluate a project's contribution to sustainable development.

A brief on the RBPL's efforts to address the MoEFCC stipulated sustainable development parameters is provided in the following paragraphs:

Social well being

- The project activity leads to social well-being by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility. This includes improvement of electricity quality, frequency and availability as the electricity is fed into a deficit grid;
- Additionally, the project envisages tieups with suppliers of the biomass, who in turn will benefit from increased revenues from their activities.
- Collection, transportation and handling of biomass residue from fields will involve manpower requirement throughout the year, hence generate employment opportunities to the rural people.

Economic well being

- Economic well being refers to additional investment consistent with the needs of the local community;

- The project activity shall create direct and indirect job opportunities to the local community during construction and shall provide permanent job opportunities during operation;
- The proposed biomass based power generating plant would contribute to the availability of continuous and sustained power to the local rice mills, thereby avoiding the load shedding and improving quality of power. This will further help in improving the socio economic status of the region;
- The main resources for power generation are biomass fuels such as rice husk. The project will generate additional revenue on account of supply of this biomass to the project, which are otherwise being under-utilized / burnt so far with no commercial value.

Environmental Well Being

- The biomass based power project has no negative environmental impacts because it utilizes the locally available resources which would otherwise have gone as "waste";
- The proposed project activity helps conserve local resources, reduces pressure on the local environment and provides improved health in addition to other environmental benefits. At the same time the uncontrolled burning of biomass in the absence of proposed project activity is prevented by use in power plant under controlled conditions, thus reducing the production of carbon monoxide and other harmful gases;
- The project utilizes locally available biomass for generating electricity which otherwise would have been generated through alternate fuels based power plants, contributing to reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions;
- Being a renewable resource, using biomass to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment and thereby contributing to environmental wellbeing.

Technology Well Being

- The technology selected for the proposed project is an energy efficient technology. Installation of such plant at RBPL will substantially upgrade the technological status of the industry, developing superior skills and competencies and will thus promote similar projects in the region.

In view of the above, the Project Participant (PP) considers that the project activity profoundly contribute to the sustainable development.

A.2. Location of project activity

Host Party

India

Region/State/Province

State: Karnataka

District: Raichur

City/Town/Community

Nearest Town	:	Raichur
Taluk	:	Yermarus
Village (Community)	:	Yedlapur Village

Physical/ Geographical location

Raichur District is situated on the North –Eastern part of Karnataka and has an area of 14,017 sq.km. The project developer has acquired 27 acres of land at approximately 15km from Raichur Town at Survey Numbers 136-140 in Yedlapur Village, Yermarus Taluk" with the following geo-coordinates.

Village	Latitude	Longitude
Yedlapur Village	16°21'58.03" N 16.21N	77°19'47.21" E 77.19E

The location of each of the project activities is provided in the following Figure A.2.1:

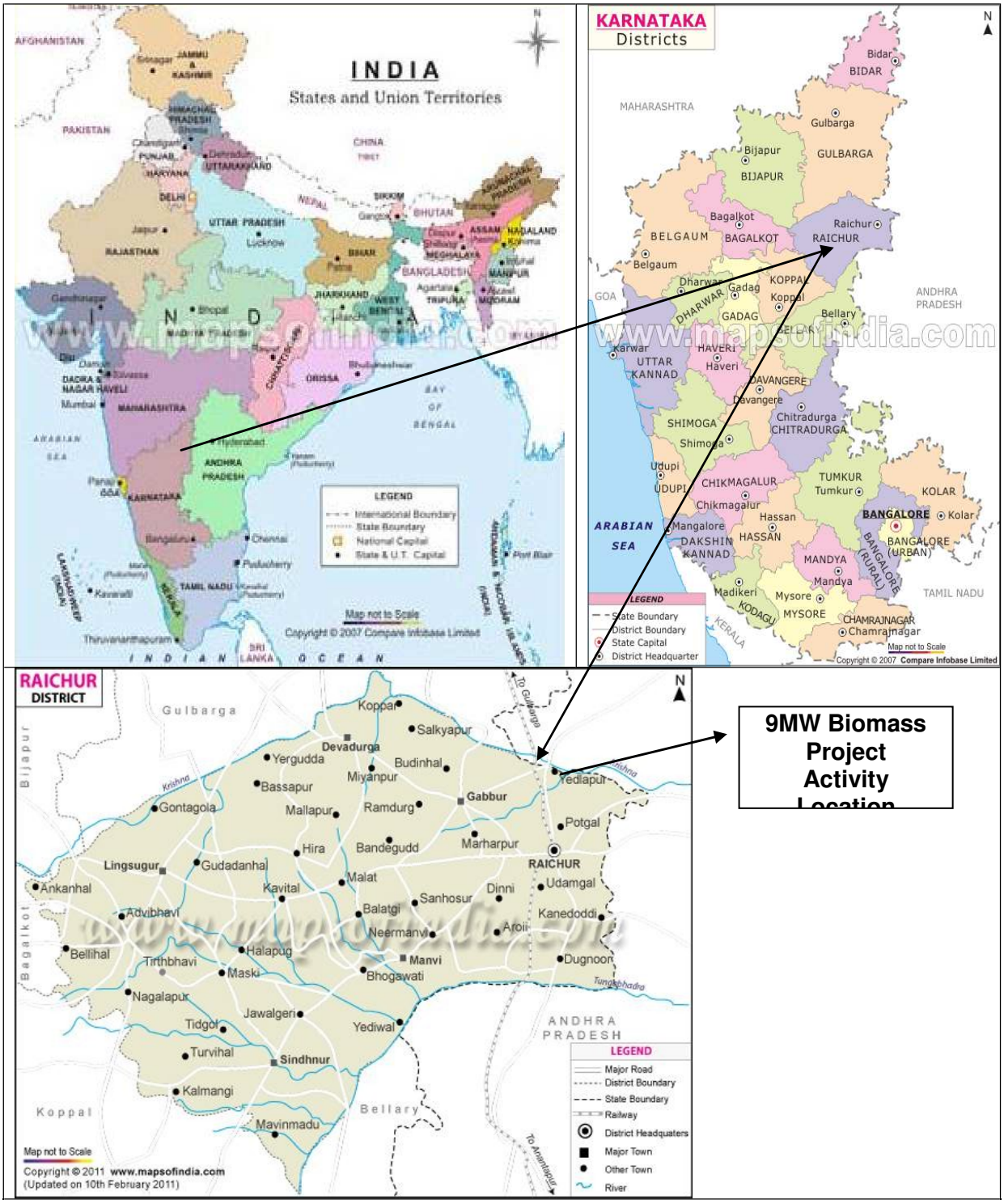

Figure A.2.1: Location of the Project Activity

A.3. Technologies/measures

The biomass power plant envisages the installation of one condensing turbo-generator of 9.0 MW nominal capacity, a Fluidized Bed Combustion (FBC) boiler operating with the steam inlet of 40 TPH @ 67 Ata and 480˚C. The turbo- generator will be installed with entire necessary auxiliary for the efficient operation of plant. The gross power generation in the power plant will be 9.0 MW with about 9% of the power generated being made available for auxiliary consumption[1]. The mechanical equipments for the power plant consist of the condensing-type turbo generator, cooling water system for oil cooling. DG set and Electrical Equipment's consisting of distributing panels etc.

It is proposed to use rice husk sourced from the nearby rice mills to attain the design PLF and station heat recovery parameter in the power generation. The rice-husk fuel will be used in boilers for steam generation, to run the turbines–generators. The rice husk fuel is seasonal-based and hence the project shall procure to the maximum extent possible during the peak season of husk fuel, and store in the premises under protected roof against rains, storm, etc. It is proposed to construct cheaper / low cost sheds to store the fuel mainly for the monsoon period of 6 months from June to November / December months of the year.

The complete system diagram for the 9MW biomass power project activity is provided in the following figure:

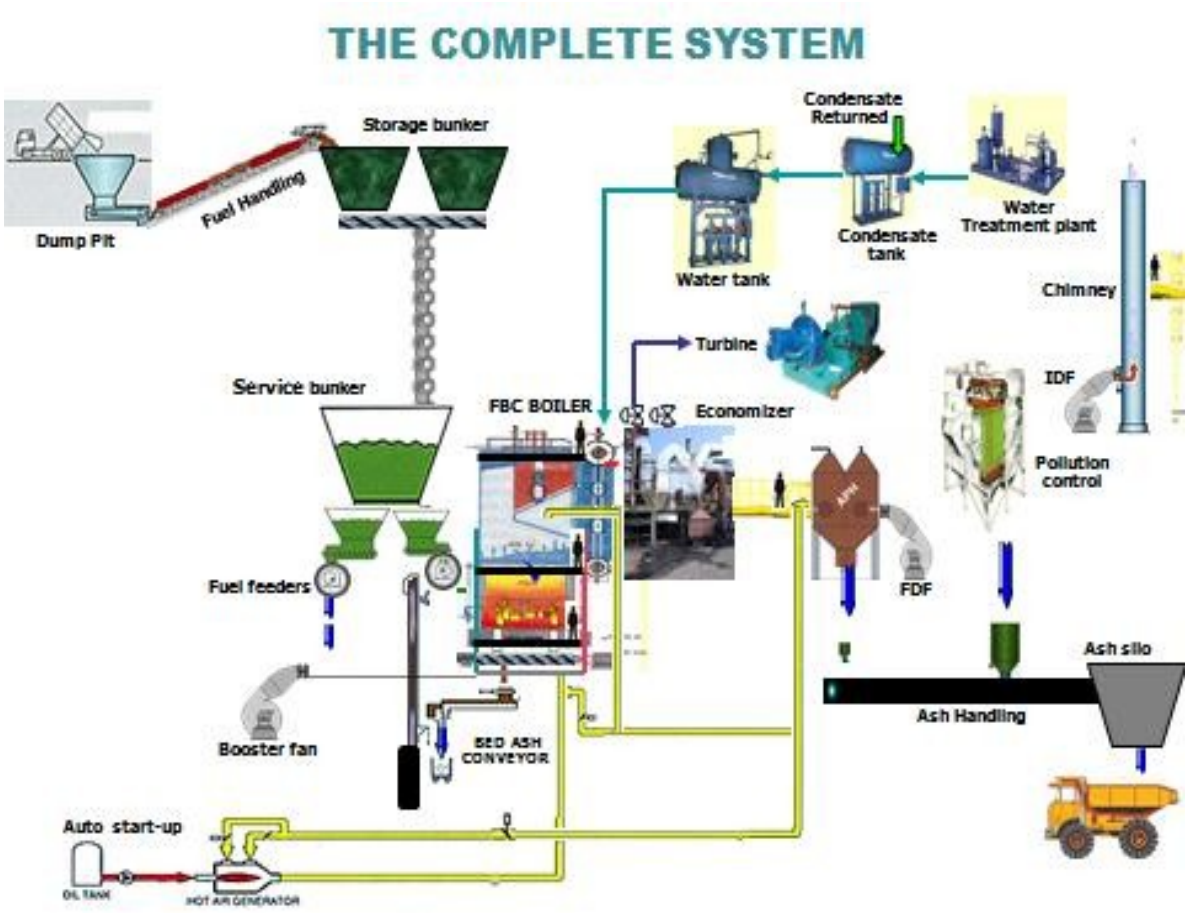

Figure A.3.1: Complete System Diagram

Sources of Biomass

[1] Karnataka Electricity Regulatory Commission's Order on NCE Tariff dated 11.12.2009

Paddy Husk:

Paddy husk is the main source of Fuel & is available from 100 rice mills, who convert paddy into rice. As per the Biomass Assessment Report approved by Karnataka Renewable Energy Development Limited on 26.06.2012, the estimated husk availability is abundant through such rice mills that make par boiled rice with Yard Drying process and rice mills that do not make any par boiled rice at all. At present, a portion of the paddy husk is utilized within the rice mills and a portion is sold to the brick industry. However, a major portion of the paddy husk is waste and the rice mills do not have enough space to store the waste paddy husk as well.

It is expected that sourcing of paddy husk from 40% of existing rice mills /year @ 80 % collection is 80,000 tons. Further, as per the Biomass Assessment Report, the hinterland spread in the districts of Raichur, Koppal, Bellary in Karnataka are paddy growing areas and hence availability of paddy husk for the power plant is very encouraging to be considered for procurement.

Hence, paddy husk is considered as a primary and only fuel for the project.

The Biomass Assessment Report identifies the following additional biomass sources as well:

Jolly Wood / Julie Flora:

This is a small shrub like plant that grows in arid climates in and around Bellary Dist. It is estimated to be possible to procure approx 5000-8000 tons /year of this wood grown on dry lands. The Fc of this fuel is 74-78 % and calorific value is also very high of 4000 K.Cal/Kg. At present this wood is converted into charcoal with large quantity as waste / loss in the conversion process. This charcoal is transported to faraway places for domestic and commercial consumption at exorbitant transportation cost, with very price realization / ton to the growers. By offering substantial better price, offering the transportation cost this hard wood of high calorific value can be easily procured for the plant. As per DIC and agriculture dept. the total area of dry land for cultivation of this commercial crop in the districts covered is approx 80000 hectares. This cultivation yields an approx quantity of 70,000 – 80,000 tons/ year. The branches of the shrub can also be used as fuel in power plant. The average moisture content of branches is 40-45 % and for stem is from 30 – 35% depending upon the season. Hence it is planned to enter into a long term contract with some of the local growers of the eucalyptus trees for regular supply of branches and tree stems.

Dolochar:

Dolochar is also available in neighbouring districts like Koppal and Bellary from the 70 sponge iron plants that are operational in the area. They generate Dolochar which has good source as fuel in Boiler.

Other Biomass:

Maize stalks, Maize Cobs and Chilli stalks are available in the months of October to May. Cotton stalks can be utilized in the months of November to May. Sunflower stalks can be procured dring the months of September to Februay. Bengalgram and Red gram stalks canb ebe utlized in the monthsof October to May. Other pulse stalks and oil seed stalks can be procured during the months of January to May and August to October.

However, the Project Proponent shall utilize only Paddy Husk as the primary and only fuel for the project activity.

Water Requirement:

Raichur has natural water resources from river Tungabhadra and Krishna. For meeting daily requirement of industrial use local reservoir will be constructed. Rain water harvesting will be done as part of the project to collect rain water and stored in the artificial bund.

Boiler Specifications

Description		Unit	
A		**Boiler**	
1	Type	-	**Fluidized Bed Combustion Boiler**
2	Nos. of Unit	Nos.	1
3	Capacity	TPH	40
4	Main Steam Pressure	Kg/cm2(a)	67
5	Main Steam Temperature	°C	480±5(Considering 0% Chlorine in the Fuel)
6	Main Steam Temperature Control Range	% BMCR	80%to100%
7	Startup Vent Capacity	% BMCR	30%
8	Feed Water Temperature to Economiser	°C	130
9	Feed Water Temperature at Deaerator Outlet	°C	130
10	Guarantee Performance Fuel	-	100%husk
11	Secondary Fuel	-	•stock/wood
B		**FDFan**	
1	Nos. per unit	%BMCR	1x100%
2	Suction Side Isolation Damper		Not Applicable
3	Air Control Through		IGV
4	Type of Lubrication		Grease
5	Voltage	V	415
C		**SAFan**	
1	Nos. per unit	%BMCR	1x100%
2	Air Control Through		IGV
3	Type of Lubrication		Grease
4	Voltage	V	415V
D		**IDFan**	
1	Nos. per unit	%BMCR	1x100%
2	Air Control Through		Pneumatically operated Inlet Multi- louver Damper
3	Type of Lubrication		Grease
4	Voltage	V	415

Boiler Feed Water:

The boiler shall be capable of operating with the following feed water quality requirements.

- pH : 8.8- 9.2
- Total hardness PPM Calcium Carbonate : nil
- Dissolved Oxygen PPM Oxygen : 0.007 max
- Total Iron PPM : 0.01 max
- Total Copper PPM : 0.01 max

- Total Sodium PPM : 0.02 max
- Total Silica PPM : 0.02 max
- Hydrazine : 0.02 -0.04 max
- Specific Electrical conductivity at 25° C : 2.0 mico ohms/cm

No.	Parameters of Boiler Feed Pump	Values
1	Nos. of Unit	2(1W+1S) Nos.
2	Suction Side Isolation Valve	Manually operated
3	Discharge Side Isolation Valve	Motor operated
4	Minimum Recirculation Arrangement by	ARV
5	Type of Lubrication	Grease
6	Mechanical Seal Provided	Yes
7	NoiseLevelat1mlimited to	92 dB(a)
8	Acoustic Enclosure if Provided	No
9	Voltage	415 V

Steam Purity

The boiler shall be capable of supplying uninterrupted steam at the MCR rating with the following steam purity levels.

- Total Dissolved Solids : 0.1 PPM max
- Silica : 0.02 PPM max

Performance Guarantee Tests

- Maximum Continuous Rating (MCR) of the boiler with the feed water temperature at 105°C and super heater outlet parameters of at 45 Kg/cm^2 and 450°C.
- Steam purity for all operating loads.

Turbo generator & Auxiliaries

The turbo generator shall be a condensing machine. The following shall be the salient design parameters.

Turbo Generator Parameters:

No	Description	Specifications
1	Turbine Type	Condensing Type
2	Inlet Steam Parameters • Pressure (Kg/cm2) • Temperature (°C) • Flow (TPH)	67 480 36
3	Exhaust Steam Pressure (Kg/cm2)	0.8
4	Generator Capacity , MW	9.0
5	The economic steam rate requires at percentage load (%)	80-100
6	Power Factor (lagging)	0.8
7	Generation Voltage (V)	11kV+/- 10%
8	Ambient temperature for Electrical Equipment design (°C)	45
9	Parallel Operation with Grid	GESCOM
10	Duty Requirements	8000 hrs/year
11	Atmospheric Conditions	Dusty

12	The maximum noise pressure level at 1.0 m distance for any equipment for equipment surface shall be equal or less than (dB(A))	85
13	System Frequency(Hz)	50+/-5%

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India(Host)	**Private Entity:** M/s Raichur Bioenergies Private Limited	No

A.5. Public funding of project activity

There is no public funding involved in this project activity.

A.6. History of project activity

a). The proposed CDM project activity is registered as CDM project having UNFCCC reference number as UN9430.
b). The proposed CDM project activity is not a project activity that has been deregistered.
c). The proposed CDM project activity is not a CPA that has been excluded from a registered CDM PoA;
d). A registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) doesn't exist in the same geographical location as the proposed CDM project activity.

A.7. Debundling

As per Annex 32, Version 2 of EB 47 Report, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale project activity or an application to register another small scale project activity with the following conditions:

(a) with the same project participants;
(b) in the same project category or technology / measure; and
(c) registered within the previous 2 years; and
(d) whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

RBPL, the Project Participant for the proposed project activity does not have a registered small-scale project activity and is not developing any other project under the same project category or technology / measure within the 1km boundary of the proposed small-scale activity at the closest point.

Hence, the RBPL project activity is not a debundled activity of a larger project activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

Title of the approved baseline and monitoring methodology: AMS-I.D "Grid Connected Renewable Electricity Generation" (Version 17, EB 61).

Reference: It has been referred from the approved methodologies for small-scale CDM project activities in the UNFCCC web site viz.
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

According to approved methodology AMS-I.D, the emission factor is calculated in a transparent and conservative manner according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1, EB 63, Annex 19).

B.2. Applicability of methodologies and standardized baselines

Category I.D: Grid Connected Renewable Electricity Generation
The project activity meets the eligibility criteria of the chosen project category as follows:

Applicability Criterion	Project Case
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid. (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	This is a Type I small-scale CDM project activity: a renewable energy project activity with a maximum output capacity equivalent to up to 15 megawatts. The project activity consists of a renewable-biomass based power plant feeding via the Southern regional grid to the rice mills in the region through a contractual arrangement with the local electricity supply companies and a power purchase agreement with the rice mills. The capacity of the proposed project activity is the maximum output capacity of the Biomass Power Project, which corresponds to 9MW, and which will not increase beyond 15MW. Hence, the project activity is eligible under this methodology.
2. AMS ID is applicable based on the Project Types as per the situations illustrated in Table 2. The situations illustrated are: • Project supplies electricity to a national/regional grid; • Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)	The project activity supplies electricity generated from a renewable-biomass based power plant via southern regional grid to rice mills in the region through a dedicated arrangement. Hence, the project activity is eligible under this methodology.
3. AMS ID is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s)	The project activity is the installation of a new power plants of 9MW capacity at a site where there was no renewable energy power plant operating prior to the implementation of the project activity. Hence, it is a greenfield project and is eligible under the project category.
4. AMS ID is applicable to hydro power plants with reservoirs that satisfy at least one of the following conditions: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2	he project activity is NOT a hydropower plant and hence this condition is NOT applicable to the project activity. However, the project still qualifies as a Type I CDM project activity as it satisfies all the eligibility criteria.

Applicability Criterion	Project Case
5. AMS ID is applicable if the unit added has both renewable and non-renewable components (e.g.,. a wind/diesel unit). In this instance, the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity has only a renewable component of 9MW capacity. And, the project activity does not have both renewable and non-renewable component. Hence, the project activity qualifies as a Type I CDM project activity as it satisfies all the eligibility criteria
6. AMS I.D is NOT applicable when the project activity involves combined heat and power (generation) systems..	The project activity generates electricity using renewable-biomass sources. Hence, the project activity is not a cogeneration system and qualifies as a Type I small-scale CDM project activity as it satisfies all the eligibility criteria
7. AMS I.D is applicable in the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility. However, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units	This project activity is a green-field project activity which does not involve addition of renewable energy generation units at an existing renewable power generation facility. Hence, this situation is not applicable for the project activity
8. AMS I.D is applicable to project activities that seek to retrofit or modify an existing facility for renewable energy generation. However, to qualify as a small-scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.	The project activity does not seek to retrofit or modify an existing facility for renewable energy generation. Moreover, the total output does not exceed 9MW. Hence, the project activity qualifies as a Type I CDM project activity as it satisfies all the eligibility criteria.

B.3. Project boundary, sources and greenhouse gases (GHGs)

As per Applicable Methodology, AMS ID, Version 17, para 9, "the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to."

As such, the project boundary is essentially the site comprising the source of fuel supply (ie., biomass) to the point of supply of the generated power to the grid and the auxiliary power consumed by the plant. Emissions associated with construction of the project have been excluded as the construction of fossil- fuel fired power plant would generate similar quantity of emissions. Hence, for the purpose of calculation of baseline emissions, southern grid of India has also been included in the project boundary. The generated power is exported to the Southern Grid whose geographic scope covers the states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu and Union Territories of Puducherry and Lakhsadweep[2].

A pictorial representation of the project boundary is provided below:

[2] CO_2 Baseline Database for the Indian Power Sector, Version 7.0, January 2012 – Government of India, Ministry of Power, Central Electricity Authority.

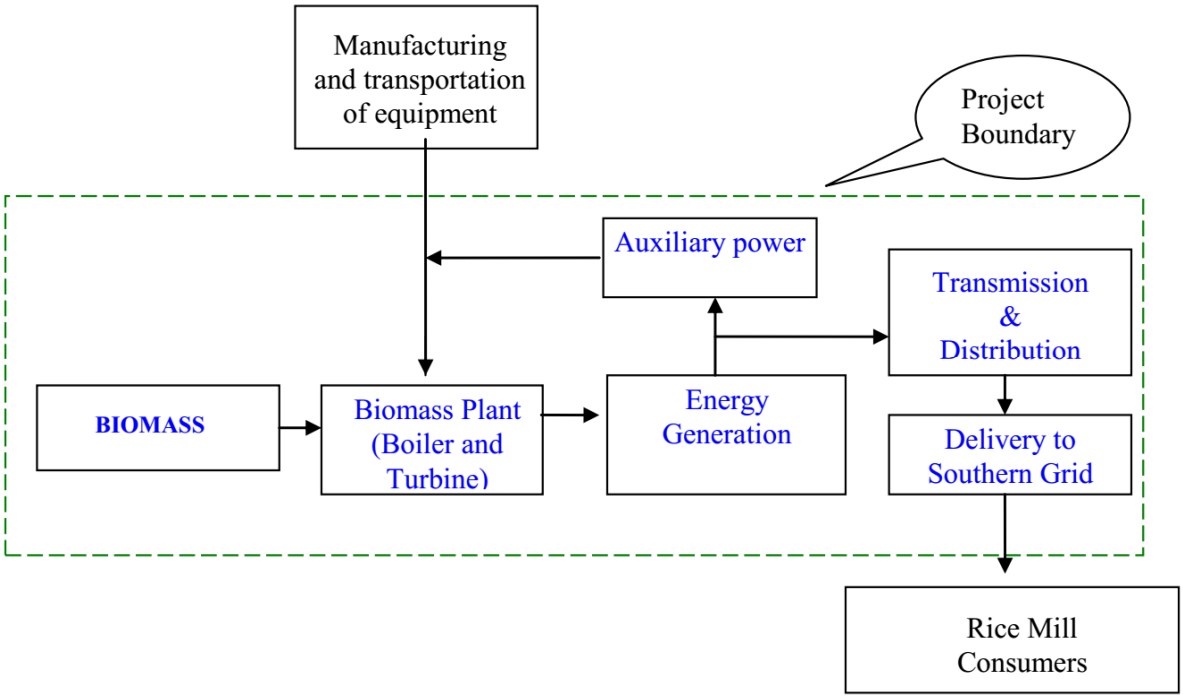

Figure B.3.1: Project Boundary

The GHG Emissions sources included in the project activity are as below

Source		GHG	Included?	Justification/Explanation
Baseline	Grid connected electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	Greenfield Biomass Project Activity.	CO_2	No	Project activity does not emit CO_2
		CH_4	No	Project activity does not emit CH_4
		N_2O	No	Project activity does not emit N_2O

B.4. Establishment and description of baseline scenario

As per Applicable Methodology, AMS ID, Version 17, para 10, "the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid".

The proposed project activity is a new, grid connected, renewable biomass based power plant. Hence, for the project activity, the baseline scenario is supply of equivalent electrical energy by current grid connected power plants and by new generation sources to be added in future. Additionally, as per Applicable Methodology, AMS ID, Version 17, para 11, the baseline emissions are defined as follows:

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

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

Where:

BE_y : *Baseline Emissions in year y (t CO_2)*

$EG_{BL,Y}$: *Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)*

$EF_{CO2,grid,y}$: *CO_2 emission factor of the grid in year y (t CO_2/MWh)*

Further, as per Applicable Methodology, AMS ID, Version 17, para 12, the emission factor can be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system";

OR

(b) The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Also, it is stated that the calculations shall be based on data from an official source (where available) and made publicly available.

In this regard it should be noted that the project is physically connected to the Southern grid and in the absence of the project equivalent amount of power would have been generated in the Southern regional grid.

For determination of emission factor since the proposed project activity is likely to affect both present and future carbon intensity of the Southern regional grid mix, the PP chooses to use Option (a), a combined margin emission factor, consisting of a combination of operating margin and build margin, calculated according to the procedures described in the "Tool to calculate emission factor of an electricity system".

The data used for the calculation has been collected by Central Electricity Authority of India and made publicly available through their website. The combined margin emission factor of the Southern regional grid published in the CEA CO_2 baseline database version 7 has been used to estimate grid intensity for the project activity.

B.5. Demonstration of additionality

Additionality:

As per the decision 17/cp.7, paragraph 43[3], a CDM project activity is additional if anthropogenic emissions of green house gases by sources are reduced below those that would have occurred in absence of registered CDM project activity. The methodology requires RBPL to provide an explanation to show that the Project Activity meets the requirements of the Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 9.0 (EB 68, Annex 27).
The PP has analysed the additionality aspects of the project activity as per the Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 9.0 (EB 68, Annex 27).

The PP is venturing first time into developing Greenfield biomass power project and is convinced that registering the project activity under CDM would help the project to sustain in the long term.

[3] UNFCCC – FCCC/KP/CMP/2005/8/Add.1 dated 30.03.2006 (08a01.pdf)

As per the Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version9.0 (EB 68, Annex 27), the project activity should face at least one barrier amongst the following:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice
- Any other barriers

The additionality has been discussed based on the "Non-binding best practice examples to demonstrate additionality for SSC project activities", EB 35, Annex 34[4].

Investment Barrier

Investment barrier: *a financially more viable alternative to the project activity would have led to higher emissions;*

Best practice examples include but are not limited to, the application of investment comparison analysis using a relevant financial indicator, application of a benchmark analysis or a simple cost analysis (where CDM is the only revenue stream such as end-use energy efficiency). It is recommended to use national or global accounting practices and standards for such an analysis.

Simple cost analysis is not applicable as the project activity sells electricity to the Utility and obtains economic benefits in the form of electricity tariffs.

The alternative to the project activity is continuation of current situation i.e. no project activity, in that case equivalent amount of electricity would have been produced by the grid electricity system. This option will not require capital investment. Hence **investment comparison analysis** (option II) cannot be applied.

The Project Participant proposes to use **Option III – Benchmark Analysis.** The guidance to investment analysis issued in EB 62 (paragraph 12) states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity (Cost of Equity) are appropriate benchmarks for equity IRR.

The Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 9.0 (EB 68, Annex 27), states that in cases where the project has more than one potential developer, the benchmark shall be based on parameters those are standard in the market, considering the specific characteristics of the project type.
The project under consideration is a biomass based power project which has multiple potential investors; therefore as per paragraph 13 & 15 of guidance on assessment of investment analysis version 5.0, EB 62,

Para 13: In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market. The DOE's validation of the benchmark shall also include its opinion on whether a company-specific benchmark or a benchmark based on parameters that are standard in the market is suitable in the context of the underlying project activity.

Para 15: If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b)

[4] http://cdm.unfccc.int/EB/035/eb35_repan34.pdf

calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors".

Based on above latest guidelines of EB 62 the cost of equity benchmark has also been calculated based on default values. As the analysis has been carried out in nominal terms, the default value of expected return on equity (given in real terms in EB 62 Annex 13) has been adjusted with the inflation. The inflation value has been taken as per the forecast by the International Monetary Fund (IMF).

The PP compared the IRR with respect to the Weighted Average Cost of Capital (WACC). The WACC is the sum of the cost of debt and cost of equity.

18.48% is the Return on Equity (RoE)

((1+ Benchmark real)*(1+ inflation rate)-1)

Default value for Real Benchmark provided by UNFCCC in "Guidelines on the Assessment of Investment Analysis, Annex 05, EB 62" Version 5.0, is = 11.75% and the Projected Inflation Rate for India in next 5 years is = 6.02%[5]

Debt: 70% & Equity: 30% (As per the KERC Order 2009 and KREDL Approved DPR for the project activity)
Therefore, Post-tax Weighted Average Cost of Capital = (70*14.75%[6])*(1-T) + ((30%*18.48%)

= **13.80%**

Financial Analysis / IRR:

The Project Participant has computed the IRR to assess the financial viability of the project activity. The IRR related assumptions are presented in the table below:

Description	Value	Units	Source
Project Size	9	MW	KREDL Approved DPR
Operating Hours	24	Hrs	
Days of Operation	330	Days	
Plant Load Factor - Year 1 - Year 2 - Year 3 onwards	 70 75 80	 % % %	Assumption based on KERC Order, 2009
Annual Generation at 80% PLF	57,024	MWh	Calculated
Auxiliary Consumption	9	%	KERC Order, 2009
Transmission loss	2	%	DPR
Net Generation	50,854	MWh	Calculated
Wheeling Charges	5	%	KERC Order, 2008 in matter of Wheeling and Banking Arrangement
Electricity Sold to Consumers	48,311	MWh	Calculated

[5] http://www.imf.org/external/pubs/ft/weo/2011/02/weodata/weorept.aspx?pr.x=79&pr.y=12&sy=2012&ey=2016&s csm=1&ssd=1&sort=country&ds=.&br=1&c=534&s=PCPI%2CPCPIPCH&grp=0&a=

[6] https://www.sbi.co.in/user.htm?action=viewsection&lang=0&id=0,16

Plant Cost	532.30	INR. Million	KREDL Approved DPR
Debt: Equity	70:30	%	KREDL Approved DPR
Debt	372.60	INR. Million	Calculated
Equity	159.70	INR. Million	Calculated
Loan Repayment Period	10	Years	KERC Order, 2009
Interest Rate	14.75	%	SBI PLR as at March 2012 as per KERC Order 2009
Tariff in 1st year	3.70	Rs. /kWh	KREDL Approved DPR
Increment in Tariff p.a.	5%	Rs /kWh	-do-
Biomass Landing Cost 1st year	2,500	INR.	KREDL Approved DPR
Escalation in Biomass cost	5	%	-do-
Biomass Required	80,000	MT/Year	KREDL Approved DPR
Operation & Maintenance (O&M) Cost	4	% of total capital cost	KERC Order, 2009
O&M Escalation from 2nd year onwards	5	%	KERC Order, 2009
Renewable Energy Certificate benefits	1.43	Rs./kWh	CERC Order 2011 with a Minimum Floor Price of Rs. 1.50/kWh with applicable reduction for registration and broker costs
Specific Fuel Consumption of Rice Husk	1.1	Kg/kWh	KREDL Approved DPR and Biomass Assessment Report

The results of IRR (post tax) without CDM revenues are presented below:

IRR post tax (without CDM): 9.52%.

The IRR after considering CDM revenues works out to be: **11.06% (post tax)** which is still below the benchmark cost of funds of 13.80%.

However, it is evident that consideration of CDM revenues boosts the returns and hence, viability of operations. As such, if the PP is able to sell certified emission reduction (CERs) from the project activity, the additional revenue generated by the carbon sales would make the project more attractive. Although the returns to the project after considering CDM revenues is still on the low side, the additional revenue from the sale of CERs does improve the financial performance of the project to the point where the PP is able to finance the project.

The Project Participant has initiated the process for availing the debt from lenders and have performed the investment analysis - Internal Rate of Return (IRR) on both the scenarios, viz IRR without CDM and IRR with CDM revenues have been projected. The lenders would be convinced to lend if the project has better returns and at the same time, the debt is serviced as

per the agreed terms. Hence the PP is convinced that CDM and its related benefits would help the project activity to be sustainable in the long term.

Sensitivity Analysis:

To assess how the project economics would work out under different scenarios, the PP has performed the sensitivity analysis for the following key parameters viz., PLF, Tariff, Project Cost, Fuel Cost and O&M Cost. However, the sensitivity analysis for potential revenue increase from sale of RECs was not performed as the PP has entered into a PPA with the power consumers under a condition that states that all REC revenues beyond the floor price shall be passed on to the power consumers. Further, the non- consideration of the RECs in sensitivity analysis is in line with the EB 22, Annex 3, 7 (b) which states that national and / or sectoral policies that have been implemented after the adoption of COP of the CDM M&P (ie., 11 November 2001) need not be taken into account. Also, it is clear that REC mechanism is a E- policy as it encourages less emission intensive technology over emission-intensive technology and the mechanism was launched much after 11 November 2001 and hence the effect of such mechanism should not be considered while demonstrating additionality of the project activity which is in line with the EB guideline EB 53 annex 32.

The sensitivity analysis for the other parameters are provided below:

Parameter	Project IRR without CDM
PLF Variation	
+ 10% increases	11.58%
Normal	9.52%
- 10% decreases	7.55%
Tariff Variation	
+ 10% increases	14.63%
Normal	9.52%
- 10% decreases	2.26%
Project Cost Variation	
+ 10% increases	7.92%
Normal	9.52%
- 10% decreases	11.38%
Fuel Cost Variation	
+ 10% increases	3.66%
Normal	9.52%
- 10% decreases	14.10%
O&M Variation	
+ 10% increases	8.99%
Normal	9.52%
- 10% decreases	10.03%

In none of the scenarios, the Project IRR (without CDM) crosses the benchmark.

The financial indicators exceed the benchmark under the following scenarios:

Parameter	Project IRR without CDM
PLF increase of more than 21%	13.92%
Tariff increase of more than 9%	14.15%

Project cost reduction of more than 20%	13.91%
Fuel cost reduction of more than 9%	14.10%
O&M cost reduction of more than 70%	13.84%

However, it is unlikely that the PLF shall increase more than 21% beyond the 80% PLF that the project is expected to achieve during the project period. Hence, the Project IRR shall not exceed the benchmark because of increased levels of PLF.

Also, it is highly unlikely that the tariff would increase beyond 9% of the existing levels as all the consumers have entered into a PPA with the PP for an annual increase of only 5%. And, any rates beyond the 5%, may also force the consumers to move to alternate distribution sources as well. Hence, the Project IRR shall not exceed the benchmark because of tariff increase.

Likewise, it is highly unlikely that the fuel cost would decrease beyond 9% of the existing levels as all the rice husk suppliers have entered into a Rice Husk Supply Agreement with the PP for an annual increase of 5%. Hence, the Project IRR shall not exceed the benchmark because of fuel cost decrease.

Further, at the current inflationary trends in the region, it is unlikely that the Project Cost and O&M cost would reduce by 20% and 70% respectively in order for the Project IRR to exceed the benchmark.

The PP is convinced that the foreseen risks such as increase in biomass cost and lower PLF would be minimised through the additional CDM revenues and making the project economically viable in the long term. Registration of the project as a CDM project activity would increase the confidence of the lenders and the potential equity investors in this project.

Prior Consideration of CDM

Annex 13 of EB 62 requires project activities for which the start date is from 02/08/2008, the PP must inform a Host Country designated national authority (DNA) and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status.

In this regard, it should be noted that following the Board Resolution dated 17/03/2012 and submission of the Detailed Project Report to Karnataka Renewable Energy Development Limited (KREDL), the PP submitted the Prior Consideration of CDM Form for each of the project activities to Host Country DNA viz., MoEFCC and UNFCCC secretariat on 23/04/2012.

Additionally, Annex 13 of EB 62 states that for project activities for which a PDD has not been published for global stakeholder consultation or a new methodology proposed or request for revision of an approved methodology is requested, every subsequent two years after the initial notification the PP shall inform UNFCCC secretariat of the progress of the project activity.

In this regard, it should be noted that the project start date is 28/03/2012. Subsequently, as mentioned earlier, the UNFCCC and MoEFCC were informed about the CDM consideration on 23/04/2012. Later, the PP published the PDD for global stakeholder consultation during the period July 25 – August 25, 2012. As such, it can be concluded that the PP has taken serious steps towards realizing CDM benefits for the project activity.

Key Milestones

The following are the key milestones of the project activity:

1. The Board moved a resolution dated 17/03/2012 approving the implementation of the 9MW Biomass Power Project as a CDM project activity;

2. The PP purchased land for implementing the project activity on 28/03/2012;
3. Letter of Award dated 27/03/2012 addressed to Climate SD Services, Bangalore to carry out all CDM related activities for the 9MW Biomass Power Project Activity;
4. Submission of Prior Consideration of CDM Form to both UNFCCC and MoEF, GoI on 23/04/2012;
5. The quotation of TUV-Rheinland (India) Private Limited for validation of the CDM project activity was accepted by the PP on 24/06/2012;
6. The Detailed Project Report and the Biomass Assessment Report was approved by Karnataka Renewable Energy Development Limited – the state nodal agency for renewable energy projects – on 26/06/2012;
7. The PDD was published for global stakeholder consultation between July 25 and August 25, 2012;
8. The Ministry of Environment and Forests, Government of India accorded Host Country Approval for the project activity on 22/11/2012.

The project activity was expected to commission on 01/04/2014 but due to cumulative time lag the commissioning of project activity got delayed and finally project activity is commissioned on 01/02/2016. The chronology of events which delayed commissioning of project activity is tabulated as below:-

Sl. No.	Description	Date of Happening	Remarks	Documents
1.	Process of Bank loan approval	11/01/2011 to 07/09/2012	The expected time of getting bank loan approval was at the starting of 2011. But it got delayed, and the loan was approved on 07/09/2012. Therefore, the project was delayed and commissioned by Feb 2016.	Bank loan approval copy
2.	Issuance of Purchase Order	07/02/2013	Due to delay in bank loan approval process, the supply orders were received by 07/02/2013.	Purchase order copy
3.	Initiation of project Civil activities	01/09/2013	After issuance of purchase order, the first civil works started on 01/09/2013 but due to releasing bankers L.C to suppliers, the civil works again got hindered and were in hold from November 2013 to April 2014.	Email Communication
4.	Time taken in getting transmission line evacuation approvals/permissions	November-2013 to April-2014	Time lag in taking approvals from state governments and in administrative procedures further delayed the project to 6 months.	Email Communication
5.	Actual date of commercial operation date	01/02/2016	The project got fully commissioned on 01/02/2016	Commissioning certificates

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reductions ER_y by the project activity during a given year 'y' is the difference between baseline emissions (BE_y) and project emissions (PE_y) including emissions due to leakage (Ly). This is represented as follows:

$$ER_y = BE_y – PE_y - L_y$$

As per the "Tool to calculate the emission factor for an electricity system" Version 02.2.1, the project proponent has to follow the following baseline methodology procedure consisting of six steps:

Step I : Identify the relevant electrical power system;
Step II : Choose whether to include off-grid power plants in the project electricity system (optional);
Step III : Select a method to determine the operating margin (OM);
Step IV : Calculate the OM emission factor according to the selected method;
Step V : Calculate the BM emission factor;
Step VI : Calculate the combined margin (CM) emission factor.

Step I : Identify the relevant electrical power system

As per CO_2 database published by the Central Electricity Authority[7], the Indian electricity system is divided into two grids viz., the Integrated North, Eastern, Western and North eastern (NEWNE) Grid and the Southern Grid. Each grid covers several states. Power generation and supply within a grid is managed by Regional Load Dispatch Centre (RLDC). Each state meets their demand with their own generation facilities and also with allocation from power plants owned and operated by central agencies like NHPC, NTPC etc. Specific quotas are allocated to each state from the central sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the grid. Moreover, there are electricity transfers between regional grids, and small exchanges in the form of cross border imports and exports. This project activity is located in the state of Karnataka which is part of the Southern Grid. As such, the relevant electrical power system is identified as the Southern Grid.

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

In this step, the PP may choose between the following two options to calculate the operating margin and build margin emission factor:

Option 1: Only grid power plants are included in the calculation;

Option 2: Both grid power plants and off-grid power plants are included in the calculation.

In this case, the PP has utilized the CO_2 database published by the Central Electricity Authority for calculating the OM and BM emission factor. And, the CO_2 database published by the Central Electricity Authority uses only Option 1 and hence the PP has included only grid power plants in the calculation.

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

The OM emission factor can be calculated using any of the following four methods:

[7] "CO_2 database of the Indian Power Sector", Central Electricity Authority, Ministry of Power, Government of India – FY 2010-11 – Version 7, January 2012

- Simple OM, or
- Simple operated OM; or
- Dispatch data analysis OM; or
- Average OM.

As per the methodology, 'Dispatch Data Analysis' is the preferred choice. However, the method is not selected for OM emission factor calculation, because dispatch data for the entire grid is not available either for the public or the project participants.

The choice of other options for calculating the OM emission factor depends on the generation of electricity from low cost/must run sources. In the context of methodology low cost/must run resources typically includes hydro, wind, low-cost biomass, nuclear and solar generation. The extent of generation from low cost/must run sources in the Southern Grid is given in Table B6.1

Table B6.1: Generation Details in Southern Grid

Particulars for Southern Grid	2006-07	2007-08	2008 – 09	2009 – 10	2010-11
Total Generation in GwH	161,897	167,379	167,587	180,638	185,257
Total Generation in GwH of low cost/must run sources	43,090	42,613	35,865	35,048	36,538
% age of Generation from low cost / must run sources	26.6%	25.5%	21.4%	19.4%	19.7%

As given in Table B6.1, the average percentage of total grid generation from low cost/must run plants is 22.5% over a five-year period. As per the Tool, the Simple OM methodology can be utilized only if low- cost or must-run resources constitute less than 50% of the total grid generation in either (1) average of the five most recent years or (2) based on long-term averages of hydroelectricity production.
At 22.5%, the average percentage of total generation from low cost or must-run plants, constitute less than 50% for the five most recent years of the data available at the time of submission of the PDD to the DOE for validation. This meets the first criterion above. Hence, Simple OM methodology is used to calculate the emission factor.

As per the methodology, the Simple OM can be calculated using either of the two following data vintages for years *y*:

- Ex-ante option: a 3-year generation weighted average based on the most recent data available at the time of submission of CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or
- Ex-post option: the year, in which project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

Also, the choice between ex-ante and ex-post vintage is to be specified in the PDD, and cannot be changed during the crediting period.

For the Project Activity, the Simple OM emission factor has been calculated ex-ante based on the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission.

Step IV: Calculate the OM emission factor as per the selected method

The simple OM emission factor ($EF_{OM,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants.

The simple OM may be calculated by one of the following options:

- Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit;
- Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The simple OM emission factor is calculated separately for the most recent three years and an average value has been considered as the OM emission factor for the baseline.

The Central Electricity Authority (CEA) has calculated the baseline Simple OM emission factors for the various regional grids in India according to the formulas specified above. As this is the most authentic information available in the public domain, the baseline emission factor used in the calculation of baseline emissions for the proposed project activity is being referred from the same for transparency and conservativeness.

Step V: Calculate the BM Emission Factor

As per the methodology, the sample group of power units *m* used to calculate the build margin consists of either;

- the set of five power units that have been built most recently, or
- the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Between the two, the methodology requires that the calculations be based on the set of power units that comprises the larger annual generation.

In terms of vintage of data, project participants can choose between one of the following two options and the chosen option should be documented in the PDD:

Option 1. For the first crediting period, calculate the build margin emission factor *ex-ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, *ex- post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex-ante*, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The Build Margin emission factor ($EF_{BM,y}$) is calculated as the generation weighted average emission factor (tCO_2 /MWh) of a sample of power plants *m*, as follows.

$$\mathbf{EF_{BM,y} = \sum F_{i,m,y} \cdot COEF_{i,m} / \sum GEN_{m,y}}$$

Where;

- $F_{i,m,y}$ = quantity of fuel *i* used in plant *m* (kt/yr) in year *y*
- $COEF_{i,m}$ = carbon emissions factor for fuel *i* in plant *m* (tCO2/kt), taking into account the carbon content of the fuels by power sources and the percent oxidation of the fuel
- $GEN_{m,y}$ = annual generation from plant *j* (MWh/yr) in year *y*

Calculations for the Build Margin emission factor $EF_{BM,y}$ has been done as *ex-ante* based on the most recent information available on plants already built for sample group m of regional grid at the time of PDD submission. The sample group *m* consists of the 20% of power plants supplying electricity to grid that have been built most recently, since it comprises of larger annual power

generation. Further, none of the power plant capacity additions in the sample group have been registered as CDM project activities.

The Central Electricity Authority (CEA) has calculated the baseline Simple OM emission factors for the various regional grids in India according to the formulas specified above. As this is the most authentic information available in the public domain. The baseline emission factor used in the calculation of baseline emissions for the proposed project activity is being referred from the same for transparency and conservativeness.

Step VI : Calculate the combined margin (CM) emission factor.

The combined margin (CM) emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,\ y}$) and the Build Margin emission factor ($EF_{BM,y}$):

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

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 2 – 5 above and are expressed in tCO_2/MWh. Combined margins shown in the database are calculated based on equal weights (User Guide version 7 page 5), that's why we go for $EF_{OM,Y}$ and $EF_{BM,Y}$ data shown on the User's Guide for validation.

Project activity emissions

As per para 19 of AMS ID (Version 17, EB 61), for most renewable energy projects, PEy =0.

However, emissions related to the operation of the Geothermal Power Plants, emissions from water reservoirs and on-site consumption of fossil fuels have to be considered. Additionally, on-site consumption of fossil fuels has to be calculated as per the EB 41, Annex 11 "Tool to calculate project or leakage CO2 emissions from fossil fuel consumption" Version 02.
The project activity is a biomass based project and hence conditions for geothermal power plants and hydropower plants are not applicable. The PP does not envisage use of fossil fuels to operate the plant. However, during emergency conditions, and in particular during the non-availability of rice husk in the region, the PP shall utilize fossil fuels to operate the plant. Hence, provision is hereby created to monitor fossil fuel consumption in eventuality of its use in the operation of the plant.

As per EB 41, Annex 11 "Tool to calculate project or leakage CO2 emissions from fossil fuel consumption" Version 02, CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,\ j,y} = \sum_{i} FC_{i,\ j,y}\ X\ COEF_{i,y}$$

Where:
$PE_{FC,j,y}$ = are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO2/yr);
$FC_{i,j,y}$ = is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);
$COEF_{i,y}$ = is the CO_2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit);
i = Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ shall be calculated as per Option B described in the tool and shall be based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EFCO_{2,i,y}$$

Where:
$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)

$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EFCO_{2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i = Are the fuel types combusted in process j during the year y

Since the PP does not intend to use coal for energy generation, the PP does not have a system for measurement of carbon % or NCV of coal. Hence, IPCC default emission factors at the upper limit of uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (energy) and NCV as provided in Table 1.2 of Chapter 1 of Vol. 2 (energy) of the 2006 IPCC guidelines on National GHG Inventories will be used to calculate the project emissions, if any.

However, as discussed the PP does not foresee any fossil fuel usage for power generation.

Project emissions due to the transportation of biomass residues to the project site:

As per methodological tool "Project and leakage emissions from biomass" version 4, para 33 "Small scale project activities may, unless otherwise required by the methodology, neglect this source of emissions if the transportation distance is less than 200 km".

As per methodology AMS I.D version 17, para 20 - For most renewable energy project activities, PEy = 0. Thus, project emissions for project activity is zero.

For project activity, the biomass transportation is within 200 Km, hence project emissions are not applicable for the project activity.

The biomass transportation distance will be monitored and if that distance is more than 200 Km, below methodological tool to be followed.

As per methodological tool "Project and leakage emissions from biomass" version 4, para 32 refers methodological tool "Project and leakage emissions from transportation of freight" for Emissions resulting from transport of biomass residue, version 1.1.0.

As per para 20 of tool "Project and leakage emissions from transportation of freight", the project emissions are determined as follows:

Accordingly, Project Emissions shall be determined as follows:

$$PE_{TR,m} = \Sigma D_{f,m} * FR_{f,m} * EF\ CO_{2,f} * 10^{-6}$$

Where:
$PE_{TR,m}$ = Project emissions from road transportation of freight monitoring period m (t CO_2)
$D_{f,m}$ = Return trip road distance between origin and destination of freight transportation activity *f* in monitoring period (km);
$FR_{f,m}$ = Total mass of freight transported in freight transportation activity *f* in monitoring period *m* (t)
$EF\ CO_{2,f}$ = Default CO_2 emission factor for freight transportation activity *f* (g CO_2 / t km)
f = freight transportation activities conducted during the monitoring period *m*

Additionally, the PP has adopted a conservative approach to only estimate the emission reductions achieved from the project activity because of transportation of biomass. As per EB 63, Annex 10 "Project and leakage emissions from road transportation of freight" Version 01.0.0, the PP may use conservative default values to determine project emissions occurring from transportation of biomass.

As explained above, during verification if the monitored biomass transportation distance is more than 200 Km, then only project emissions due to transportation of biomass will be considered. If transportation distance is less than 200 Km, then project emissions will be neglected.

In the project activity, all freight transportation activities shall be conducted using Heavy Vehicles. As per the tool, the applicable emission factor shall be 129 g CO_2 / t km.

Leakage

As per para 20 of AMS ID (Version 17, EB 61), leakage is to be considered only if the energy generating equipment is transferred from another project activity. In this case, the Biomass Project Activity is a greenfield project activity and does not involve transfer of equipment from another project activity.

As per EB 47, Annex 28, Indicative simplified baseline and monitoring methodologies fore selected small-scale CDM project activity categories, Attachment C to Appendix B, General Guidance on leakage in biomass project activities, Version 03 specifies that for the small scale project activity, the leakage emission sources can be identified as follows:

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

The PP hired the services of the ImageX Technologies Private Limited to conduct a Biomass Assessment Study to cover the project area. The Biomass Assessment Report was approved on 26/06/2012 by Karnataka Renewable Energy Development Limited (KREDL), the sate nodal agency for approving renewable energy projects. The salient findings of the Biomass Assessment Report are as follows:

- The biomass being used in the project activity is a waste generated from the rice mill activity already existing in the region. This waste would have been generated even in the absence of the project activity and would have been burnt in the field in uncontrolled manner. The plant uses the waste generated and does not need application of fertilizer and clearance of land. Hence there are no emissions due to the same.
- As the project activity utilizes only rice husk, the implementation of project activity does not lead to shifting of pre-project activities. This is proved in the paragraphs below.\
- The only possible source of leakage in the project activity can be competing uses of biomass - The biomass residue may in the absence of the project activity be used elsewhere, for the same or a different purpose. The Biomass Assessment Study shows that a power potential of 20MW is estimated from rice husk alone in the region. And, the PP is entering into an exclusive Rice Husk Supply agreement with the rice mills. Over 69 rice mills (out of 100 in the region) have entered into a Rice Husk Supply Agreement with the PP. These 69 rice mills produce a quantity of approximately 300,000 tons of rice husk per annum. Out of this total quantity, only 80,000 tons constituting less than 30% of the total biomass generation shall be used in the project activity.

If the remaining 31 rice mills are taken into consideration there shall be generation of an additional 150,000 tons of rice husk annually in the region. As such, the study demonstrates that enough quantity of rice husk is available in the region to operate the project activity after considering the biomass residue utilization in the area; hence this source of leakage is neglected. In fact, the KREDL approval letter states that a total of 57.4MWe biomass-based power generation capacity is available within the district.

Hence, leakage is not considered.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{OM,y}$
Data unit	tCO2/MWh
Description	Operating Margin emission factor for Southern Grid
Source of data	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0.
Value(s) applied	0.95 tCO_2/MWh
Choice of data or measurement methods and procedures	Calculated as an average 3 years vintage data and option of *ex-ante* calculation based on Simple OM Method. Computed once during PDD finalization for each crediting period.
Purpose of data	To calculate the emissions reductions achieved from the project activity
Additional comment	The data will be archived for two years beyond the crediting period

Data/Parameter	$EF_{BM,y}$
Data unit	tCO2/MWh
Description	Build Margin emission factor for Southern Grid
Source of data	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0.
Value(s) applied	0.73 tCO_2/MWh
Choice of data or measurement methods and procedures	Calculated for the most recent data and option of *ex-ante* calculation based on "20% of total generation approach". Computed once during PDD finalization (ex-ante).
Purpose of data	To calculate the emission reductions achieved from the project activity
Additional comment	Records to be archived for two years beyond the crediting period.

Data/Parameter	EF_y
Data unit	tCO2/MWh
Description	Combined Margin CO_2 emission factor for Southern Grid
Source of data	Estimated figure based on 50% of OM and 50% of BM values, referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0
Value(s) applied	0.84 tCO_2/MWh
Choice of data or measurement methods and procedures	Calculated ex-ante based on 50% of OM and 50% of BM values approach". Computed once during PDD finalization (ex-ante).
Purpose of data	To calculate the emission reductions achieved from the project activity
Additional comment	Records to be archived for two years beyond the crediting period.

In addition, as per Applicable Methodology, AMS ID, Version 17, para 19 *"the quantities and types of biomass and the biomass to fossil fuel ratio (in case of co-fired system) to be used during the crediting period should be explained and documented transparently in the CDM-PDD. For the selection of the baseline scenario, an ex-ante estimation of these quantities should be provided. The Quantities and Types of Biomass used during the crediting period is as follows:*

Data/Parameter	SFC (Rice Husk)
Data unit	Kg/kWh
Description	Specific Fuel Consumption of Rick Husk utilized in the project activity
Source of data	Biomass Assessment Report
Value(s) applied	1.3 Kg/kWh
Choice of data or measurement methods and procedures	The detailed calculations are provided in the Biomass Assessment Report prepared by a third-party agency. Computed once during PDD finalization (ex-ante)
Purpose of data	The data is used to estimate the quantity of the rice husk required for the project activity.
Additional comment	The SFC for Rice Husk used in the project activity shall be monitored on a monthly basis and shall be compared with the values used at the time of submission of PDD. The variance in the values (if any) shall be reported in the Monitoring Report. Records shall be archived for two years beyond the crediting period.

Data/Parameter	***q water***
Data unit	Percentage
Description	Percentage of moisture in biomass residue (wet basis)
Source of data	Laboratory test reports
Value(s) applied	10% (generic industry value)
Choice of data or measurement methods and procedures	Measured through in-house laboratory tests. As per methodology, The moisture content of biomass of homogeneous quality shall be determined ex ante. The weighted average should be calculated and used in the calculations
Purpose of data	The data will be monitored to determine the operational consistency
Additional comment	All data will be kept for a minimum of 2 years in soft copies following issuance of CERs or the end of the crediting period, whichever is later.

Further, as per EB 63, Annex 10, Methodological Tool for "Project and Leakage emissions from road transportation of freight" the default emission factors are used for the crediting period for transportation of biomass:

Data/Parameter	EF_{CO2}
Data unit	g CO_2 / t km
Description	Default CO_2 emission factor for freight transportation activity
Source of data	EB 63, Annex 10, Page 4 "Tool to Calculate Project or Leakage Emissions from road transportation of freight"
Value(s) applied	129 g CO_2 / t km
Choice of data or measurement methods and procedures	As suggested in the Tool for heavy vehicles (ex-ante)
Purpose of data	The data is used to estimate the project emissions resulting from transportation of rice husk from rice mills to the project activity site. This factor is applicable only when transportation distance (to and fro) is more than 200 Km
Additional comment	All transportation activities shall be done using heavy vehicles.

B.6.3. Ex ante calculation of emission reductions

Baseline emission (BE_y):

According to section B.6.1 and 6.2, the baseline emission factor of the project (EF_y) (i.e the combined margin emission factor of the southern grid) is 0.84 tCO_2e/MWh during the crediting period. According to the DPR, the annual power supplied to the grid by the project (EG_y) is expected to be 50.854 Million Units. The baseline emissions have been calculated using the following equation:

$$BE_y = EG_{BL,y} * EF_{CO2}$$

Where:

BE_y	=	Baseline Emissions
$EG_{BL,y}$	=	Net Generation from the Project in year y
EF_{CO2}	=	Combined Margin Baseline Emission Factor for Southern Grid

Table B.6.3.1 provides information on baseline emission calculations**:**

Table B6.3.1: Related Information on Baseline Emissions Calculations

Project Parameter	Project Information
Installed Capacity	9MW
Plant Load Factor from Year 3 after plant stabilization	80%
Number of days of operation	330
Number of Hours of operation	7920 Hours
Gross Generation from the project	57,024MWh
Auxiliary Consumption	9.0%
Transmission Losses	2.0%
Net Generation from the project	50,854MWh
Combined Margin Baseline Emission Factor for Southern Grid	0.84 tCO2e / MWh
Annual Baseline Emissions	42,717tCO_{2e}

Project emission (PE_y)

As per para 19 of AMS ID (Version 17, EB 61), for most renewable energy projects, PEy =0.

As per methodological tool “Project and leakage emissions from biomass” version 4, para 33 “Small scale project activities may, unless otherwise required by the methodology, neglect this source of emissions if the transportation distance is less than 200 km”.

For project activity, the biomass transportation is within 200 Km, hence project emissions are not applicable for the project activity.

The biomass transportation distance will be monitored and if that distance is more than 200 Km, below methodological tool to be followed.

However, the PP has adopted a conservative approach to just estimate the emission reductions achieved from the project activity. Hence, the project activity emissions from the combustion of fossil fuels for transportation of biomass residues have been considered in the emission reduction calculations. Accordingly, Project Emissions are determined as follows:

$PE_{TR,m} = \Sigma D_{f,m} * FR_{f,m} * EF\ CO_{2,f} *10^{-6}$

Where:
$PE_{TR,m}$ = Project emissions from road transportation of freight monitoring period m (t CO_2)
$D_{f,m}$ = Return trip road distance between origin and destination of freight transportation activity *f* in monitoring period (km);

$FR_{f,m}$ = Total mass of freight transported in freight transportation activity *f* in monitoring period *m* (t)
$EF_{CO2,f}$ = Default CO_2 emission factor for freight transportation activity *f* (g CO_2 / t km)
f = freight transportation activities conducted during the monitoring period *m*

In the project activity, the biomass residues are transported (within the 50km radius) to the project site by heavy vehicles and the CO_2 emissions resulting from transportation of the biomass residues to the project plant is calculated on the basis of distance and number of trips.

Table B.6.3.2 provides information on project emission calculations:

Table B6.3.2: Related Information on Project Emissions Calculations

Project Parameter	Project Information	Source
Average Biomass Residues required per year	80,000TPA	DPR
Average round-trip distance	100km	Field Data
Default value of CO_2 emission factor Heavy Vehicles	129 g /t km	EB 63, Annex 10
Annual Project Emission	1032 tCO_{2e}	

The estimated project emissions at 1032 tCO_{2e} is 2.42% of the total emission reductions estimated to occur from the project activity and hence considered while estimating the overall reductions from the project activity in order to be conservative.

Hence, **PE_y = 1032 t CO_{2e}**
The above project emissions are estimated just for emission reduction estimation purpose. However this project emissions will be considered during verification only when transportation distance (to and fro) is more than 200 Km.
Leakage (LE_y):

As per para 20 of AMS ID (Version 17, EB 61), leakage is to be considered only if the energy generating equipment is transferred from another project activity. In this case, the project activity is a green-field project activity and does not involve transfer of equipment from another project activity.

Further, as per EB 47, Annex 28, Indicative simplified baseline and monitoring methodologies fore selected small-scale CDM project activity categories, Attachment C to Appendix B, General Guidance on leakage in biomass project activities, Version 03, leakage is to be considered in case the project activity utilizes biomass residues from external sources.

In such cases, leakage may occur because of the diversion of biomass from other activities outside the boundary thereby increasing the fossil fuel consumption outside the boundary. However, in this particular project activity, the biomass requirement for the project is small. Additionally, there is sufficient biomass available in the region surrounding the site of the project activity and hence, no such leakage is anticipated. The availability of the surplus biomass is indicated in the Biomass Assessment Report prepared ex-ante. Hence, it is concluded that the usage of biomass in the project activity does not lead to leakage elsewhere. Therefore, in the present context, the leakage is neglected.
Hence, **LE_y = 0 (Zero)**

The table B6.3.3 provides related information on baseline emission reduction calculations:

Table B6.3.3: Related Information on Emission Reduction Calculations

Project Parameter	Project Information
Installed Capacity	9MW
Plant Load Factor from Year 2 after plant stabilization	80%
Number of days of operation	330
Number of Hours of operation	7920 Hours
Gross Generation from the project	57,024MWh
Auxiliary Consumption	9.0%
Transmission Losses	2.0%
Net Generation from the project	50,854MWh

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	37,378	1,032	0	36,346
Year 2	40,048	1,032	0	39,016
Year 3	42,717	1,032	0	41,685
Year 4	42,717	1,032	0	41,685
Year 5	42,717	1,032	0	41,685
Year 6	42,717	1,032	0	41,685
Year 7	42,717	1,032	0	41,685
Total	291,012	7,224	0	283,788
Total number of crediting years	7 years			
Annual average over the crediting period	41,572	1,032	0	40,540

Year 1 starts from date of commissioning and represents from 01/02/2016 to 31/01/2017 and same approach follows for remaining years.

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{BL,y}$
Data unit	MWh
Description	Quantity of Net Electricity supplied to the grid by the project during the year y
Source of data	B-From issued by the Karnataka Power Transmission Corporation Limited
Value(s) applied	50,854 MWh
Measurement methods and procedures	Quantity of Net Electricity supplied to the grid is calculated using the following: $EG_{BL, y} = EG_{(Export), y} – EG_{(Import), y}$
Monitoring frequency	Monthly or as specified in the Agreement between PP and KPTCL

QA/QC procedures	The meters are Tri-vector meters of 0.2S accuracy class. Quantity of Net Electricity supplied to the grid will be checked for consistency by comparing the readings obtained from the calculations with that of the electricity measured as $EG_{(Gross),\ y}$ and deducting the auxiliary consumption of electricity at the project site. This shall be crosschecked with the records for the sold electricity.
Purpose of data	Data shall be used to calculate the emission reductions achieved from the project activity
Additional comment	All data will be kept for a minimum of 2 years in soft copies following issuance of CERs or the end of the crediting period, whichever is later.

Data/Parameter	**$BF_{I,\ y}$**
Data unit	Tonnes / year
Description	Quantity of biomass residue '*i*' received in the project activity each year
Source of data	Plant records and log books
Value(s) applied	80,000 T/year
Measurement methods and procedures	All the biomass received shall be measured using a weigh-bridge located at the project site and recorded truck-wise as is received. The data shall be collated daily and monthly basis for the biomass utilized in the project activity.
Monitoring frequency	Daily (as received)
QA/QC procedures	Calibration of the weigh bridge shall be performed as per the recommendation of the manufacturer. The weigh-bridge records will be cross-checked using the following formula: $BF_{I,\ y}$ = Opening Stock + Receipts – Closing Stock
Purpose of data	The data will be monitored for all the biomass residues used in the project activity scenario and estimate annual energy balance and efficiency of energy generation. However, the data is not utilized in the determination of emission reductions.
Additional comment	All data will be kept for a minimum of 2 years in soft copies following issuance of CERs or the end of the crediting period, whichever is later.

Data/Parameter	**FC_y**
Data unit	Tonnes / year
Description	Quantity of coal used in the project activity each year
Source of data	Plant records and log books
Value(s) applied	Zero
Measurement methods and procedures	All the coal received shall be measured using a weigh-bridge located at the project site and recorded truck-wise as is received. The data shall be collated daily and monthly basis.
Monitoring frequency	Daily (as received)
QA/QC procedures	Calibration of the weigh bridge shall be performed as per the recommendation of the manufacturer. The weigh-bridge records will be cross-checked using the following formula: FC_y = Opening Stock (Coal) + Receipts for Coal Purchase – Closing Stock (Coal)
Purpose of data	The data will be used to estimate annual energy balance and efficiency of energy generation. And, the ex-post values are used to determine project emissions.

Additional comment	All data will be kept for a minimum of 2 years in soft copies following issuance of CERs or the end of the crediting period, whichever is later.

Data/Parameter	**$NCV_{i,y}$**
Data unit	kCal/kg
Description	Net Calorific Value of Rice Husk used in project plant for power generation
Source of data	Periodic test reports from a third-party laboratory
Value(s) applied	Paddy Husk: 3,200 kCal/kg
Measurement methods and procedures	Measurement performed in third-party laboratories according to relevant national / international standards. The fuel analysis tests will be carried out quarterly, taking at least three samples for each measurement during the first year of the crediting period. The average value shall be used for the rest of the crediting period.
Monitoring frequency	Determine once in the first year of the crediting period
QA/QC procedures	Third-party laboratories shall be required to provide calibration test results as per national standards for such measurements.
Purpose of data	The data will be monitored for all the biomass residues used in the project activity scenario. However, the data is not utilized in the determination of emission reductions.
Additional comment	All data will be kept for a minimum of 2 years in soft copies following issuance of CERs or the end of the crediting period, whichever is later.

Data/Parameter	**$NCV_{(Coal),y}$**
Data unit	TJ/Gg
Description	Net Calorific Value of Coal used in project plant.
Source of data	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	32.2 TJ/Gg
Measurement methods and procedures	Since values are not provided by fuel supplier in Invoices, IPCC default values are used.
Monitoring frequency	Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	Not Applicable as IPCC default values are used.
Purpose of data	The data will be monitored for all the coal used in the project activity scenario. And, the data shall be utilized ex-post to determine project emissions.
Additional comment	All data will be kept for a minimum of 2 years in soft copies following issuance of CERs or the end of the crediting period, whichever is later.

Data/Parameter	**$D_{f,m}$**
Data unit	Km
Description	Return-trip road distance between origin of rice husk biomass and the project site during the monitoring period
Source of data	Records by PP
Value(s) applied	100 km
Measurement methods and procedures	Determined once during the monitoring period from each of the rice mills supplying rice husk to the project activity
Monitoring frequency	To be updated when rice mill source changes

QA/QC procedures	Odometer reading to be verified once annually for each rice mill
Purpose of data	The data will be monitored to determine the project emissions. This parameter is applicable only when transportation distance (to and fro) is more than 200 Km.
Additional comment	All data will be kept for a minimum of 2 years in soft copies following issuance of CERs or the end of the crediting period, whichever is later.

Data/Parameter	**$FR_{f,m}$**
Data unit	Tonnes / year
Description	Quantity of biomass residue '*i*' received in the project activity each year
Source of data	Plant records and log books
Value(s) applied	80,000 T/annum
Measurement methods and procedures	All the biomass received shall be measured using a weigh-bridge located at the project site and recorded truck-wise as is received. The data shall be collated daily and monthly basis for the biomass utilized.
Monitoring frequency	Daily (as received)
QA/QC procedures	Calibration of the weigh bridge shall be performed as per the recommendation of the manufacturer. The weigh-bridge records will be cross-checked using the following formula: $BF_{I, y}$ = Opening Stock + Receipts – Closing Stock
Purpose of data	The data will be monitored for all the biomass residues used in the project activity scenario and estimate the project emissions. This parameter is applicable only when transportation distance (to and fro) is more than 200 Km.
Additional comment	Records will be archived for two years beyond the crediting period

Data/Parameter	EF_{CO2}
Data unit	Kg/TJ
Description	Default CO_2 emission factor for coal
Source of data	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 , Chapter 1, 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	101,000 Kg/TJ or the value in the most recent version of the data source mentioned above for the monitoring period.
Measurement methods and procedures	As suggested in EB 41, Annex 11 "Tool to calculate project or leakage CO2 emissions from fossil fuel consumption" Version 02
Monitoring frequency	As required
QA/QC procedures	It shall be ensured that the most recent version of the data source shall be utilized for the monitoring period.
Purpose of data	The data is used to estimate the project emissions resulting from use of coal for operating the project.
Additional comment	Records will be archived for two years beyond the crediting period

B.7.2. Sampling plan

There is no sampling plan that is envisaged for this project activity.

B.7.3. Other elements of monitoring plan

The purpose of the monitoring plan is to ensure that the required data is accurately monitored and recorded to enable the calculation of the emission reductions achieved by the project activity.

As per AMSID, Ver. 17, EB61, Paragraph 13, Monitoring shall consist of monitoring the following parameters:

- Net electricity exported to grid.
- Quantity of biomass received in project activity.;
- Quantity of coal received in the project activity;
- Net calorific value of biomass utilized in the project activity;
- Net calorific value of coal utilized in the project activity;
- Default CO_2 emission factor for coal
- Round-trip travel distance between rice mill from where rice husk is sourced and the project activity

Operational and Management Structure

RBPL proposes to have a monitoring team with the responsibility of overseeing the collection, recording and storage of the data required to calculate and monitor the greenhouse gas emission reductions from the project activity. The data that is required to be monitored is described in detail in Section B7.1.

RBPL, the Project Proponent, shall have a team consist of the following:

- **Technical Director:** Overall responsibility of compliance with the CDM monitoring plan who shall the common person in charge of each of the project activities
- **Project Manager:** Quality assurance of the data/report generated by Project Engineer.
- **Project Engineer:** Responsibility of log preparation, data recording, Checks for completeness and reliability of data, data analysis, initiating calibration activities and preparing of reports.
- **Shift Operator:** Responsibility for weigh-bridge measurements,

An outline of responsibilities and reporting function of each of these key positions are contained in Table B7.3.1. The specific monitoring provisions are described in more detail in the following table:

Table B7.3.1 CDM Monitoring Team for the RBPL Project

Position	Outline of Responsibilities	Reporting
Technical Director	• Overall responsibility of compliance with CDM Monitoring Plan	Managing Director
Project Manager	• Undertakes regular internal audits of the project. • Ensures compliance with RBPL's QC procedures. • Overseas the collection, recording and storage of data. • Reviews and approves all reports; • Investigation of irregularities to ensure compliance with the CDM monitoring plan.	Technical Director
Project Engineer	• Supervises meter calibration requirements; • Initiates third-party calibration activities as required; • Responsible for the completeness and reliability of the data. • Responsible for monitoring measurements; • Preparation of reports	Reports to Project Manager
Shift Operator	• Responsible for conducting biomass measurements, fossil fuel consumption measurements and continuous electricity measurements	Reports to Project Engineer

All the responsibilities of the CDM monitoring team shall be in addition to the responsibilities carried out by the team members as laid out in the company's guidelines for similar positions.

Monitoring Provisions

Training

The members of the CDM Monitoring Team will be suitably qualified and trained in the operation and maintenance of the power plant. The team members will also receive appropriate training in the CDM monitoring requirements, which will include an overview of the CDM and all elements of the monitoring plan in detail. A copy of the project monitoring plan will be distributed to all of the members of the cell during the training, and an additional copy will be easily accessible at appropriate locations on site.

Specific Data Monitoring Procedures

Installation of the Meters:

The Gross Generation of electricity shall be monitored by the Project Proponent by installing a state-of- the-art sealed and tested meters at the point of generation. The auxiliary consumption of electricity shall be monitored by the project proponent by installing a state-of-the-art meter that records the auxiliary consumption of the project activity. The metering system at the KPTCL sub-station will comprise a main meter that will record the net electricity exported by the project activity to the grid and a back-up meter. The accuracy class of electricity meters shall be 0.2.

Calibration of Meters:

The Project Engineer will ensure that a manufacturer's test certificate accompanies all purchased meters. A report summarising meter calibration requirements will be prepared by the Project Engineer on project commissioning, and updated with each recalibration. The meters shall be calibrated at the time of installation and recalibrated every year thereafter. The calibration of the meters at the KPTCL sub- station shall be as per the PPA requirements.

Metered Net Electricity Export Data:

Metered net electricity export data will be measured continuously. A monthly report of metered net electricity export data will be generated by the Project Engineer, and saved in electronic and paper form. The monthly report will be reviewed and approved by the Project Manager, to ensure that the data is reported consistently and can be compared to previous months. Any irregularities will be investigated as described below in "Review of Reports and Treatment of Uncertainty". The auxiliary loads and losses (gross metered electricity generation minus net generated electricity) will be recorded in the monthly report, to be used in the event of meter failure, as described below in "Emergency Preparedness".

Emission Reductions Calculations:

Emission reductions will be calculated on an annual basis using the project and baseline emission data. Emission reductions occurring as a result of the project activity will be summarized in an Annual Report that will be prepared by the Project Engineer. The Report will be reviewed and approved by the Project Manager, to ensure that the data is reported consistently and can be compared to previous reports.

Measurement of Biomass Consumption

The record of quantity of biomass residue procured will be maintained at the factory gate and later transferred on daily basis to central record maintenance system of the CDM cell. Records Receipts maintained at the main gate shall include the type of biomass, name of collection centre, net weight of biomass, date and time of receipt of consignment etc. This will form basis for monitoring the number of truck trips and the average distance travelled to determine the project emissions.

Measurement of Coal Consumption

The record of quantity of coal procured will be maintained at the factory gate and later transferred on daily basis to central record maintenance system of the CDM Cell. Records Receipts maintained at the main gate shall include name of collection centre, net weight of coal, date and time of receipt of consignment etc. This will form basis for monitoring the number of truck trips and the average distance travelled to determine the project emissions.

Measurement of Net Calorific Values of Biomass

The measurement of the Net Calorific Value of the biomass utilized for the project activity shall be performed in third-party laboratories according to relevant national / international standards. The fuel analysis tests will be carried out quarterly, taking at least three samples for each measurement during the first year of the crediting period. The average value shall be used for the rest of the crediting period.

Measurement of Net Calorific Value of Coal

Since values are not provided by fuel supplier in Invoices, IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provide in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
.

Estimate Energy Balance:

Based on the data obtained above, including gross energy generation, biomass and fossil fuel consumption and Net Calorific Values, the Project Engineer shall estimate the Energy Balance on a quarterly basis and determine the efficiency of plant operation. The estimation of energy balance shall be summarized in the Annual Report that will be prepared by the Project Engineer. The report will be reviewed and approved by the Project Manager, to ensure that the data is reported consistently and can be compared to previous reports.

Emergency Preparedness:

The project has the necessary provisions for emergency preparedness to deal with any unforeseen events such as fire or an electrical blackout. These provisions include installed fire fighting systems, and standby features for critical items. In the situation where an emergency causes unintended emissions, these emissions will be quantified and recorded on a daily basis by the Project Engineer and summarized in a discrete section of the Emission Reductions Report.

In the event that the main meter, which is used to record the net electricity exported by the project, is found to be faulty it will be repaired or replaced and the data from the backup meter will be used in its place. In the unlikely event that the backup meter fails it will also be repaired or replaced and the net electricity will be taken as the average over the most recent six months, using the values recorded in the Metered Net Electricity Generation monthly reports, described above. In the event of meter failure, the details will be recorded by the Project Engineer and summarized in a discrete section of the Emission Reductions Report.

Reporting

Summary of Monitoring Reports

A summary of the monitoring reports is contained in Table B7.3.2

Table B7.3.2 Monitoring Reports for RBPL Project Activity

Report	Responsibility	Frequency
Meter Calibration Report	Project Engineer	At project commissioning and updated with each recalibration.

Weigh-Bridge Calibration Report	Project Engineer	At project commissioning and updated with each recalibration.
Calibration Report from Third-Party Agencies	Project Engineer	At the time of submission of respective report by the third-party agency
Third-Part Test Reports for NCV of Biomass and Coal	Project Engineer	Determine once in the first year of the crediting period for Biomass and Annual for Coal
Metered Net Electricity Export Data	Project Engineer	Monthly
Emission Reductions	Project Engineer	Annually
Energy Balance Estimates	Project Engineer	Annually
Emergency Report: Unintended Emissions	Project Engineer	Daily (as required)
Emergency Report: Meter Failure	Project Engineer	Daily (as required)
Internal Audit Report	Project Manager	Half-Yearly

Review of Reports and Treatment of Uncertainty

All reports will be reviewed and approved by the Project Manager Engineer. When reviewing the Metered Net Electricity Export Data, Emission Reductions report and Energy Balance estimates, the Project Manager will examine the report for data anomalies and compare the report with previous reports for consistency. If any discrepancies are found they will be investigated and corrected. The discrepancies and corrective actions will be recorded in an appendix to the relevant report. If the corrective actions result in any adjustments to monitoring data, then the relevant report will be revised after carrying out the necessary adjustments.

Project Manager will undertake an internal audit of the project every half-yearly to ensure the operational and maintenance regime of the project and data collection and recording practices are compliant with the content of this Project Design Document. The results of the audit will be summarised in a report, which will be sent to the Technical Director for review. The report will also list any corrective actions required to ensure project compliance.

Record Storage

A paper copy of all documentation will be stored in a secure area within the site head office. All reports will be signed and date stamped after review by the Project Manager, prior to being filed in storage. All electronic reports will be backed-up on a monthly basis and sent to RBPL's Head Office. All archived data will be kept until two years after the last issuance of CERs for this project.

The documents that will be stored include:

- Manufacturer's test certificate accompanies and meter calibration reports;
- B-Form issued by KPTCL;
- Monthly report of metered net electricity export data;
- Quarterly Report on Emission Reductions;
- Quarterly Report on Energy Balance Estimates;
- Internal audit reports

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

28/03/2012. (A major investment viz., towards purchase of land was made by the PP on this date)

C.2. Expected operational lifetime of project activity

25 years (Meets the requirements of EB 50, Annex 15 "Tool to determine remaining lifetime of equipment", Version 01, where the default value for technical lifetime of boilers is 25 years)

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable Crediting Period

C.3.2. Start date of crediting period

The start date of crediting period is 01/02/2016.

C.3.3. Duration of crediting period

7 years 00 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The proposed project activity is a biomass-based power project. This category of projects does not require an environmental impact analysis to be performed under the existing national and regional laws of the host party (India). However, as part of the preparation of the Detailed Project Report, RBPL performed an environment impact analysis of the project activity, the findings of which are summarized below:

There are no negative environmental impacts arising due to project activity. However, the significant positive environmental impact arising from the project activity is the reduction in carbon dioxide emissions from the replacement of fossil fuels which otherwise would have been used under the baseline scenario for generation of electricity.

The environmental impacts due to the rice husk-based power plant are in the form of air emissions, water use, waste water effluent, ash disposal and noise. The environmental impact and a brief on the proposed environmental management plan is provided in the following paragraphs:

Air Emissions:

Particulate matter from the flue gas will be controlled through the use of electro-static-precipitator. RBPL proposes to install an ESP for the reduction of particulate emission to less than 100mg/Normal m3 to which is well below the limits prescribed by Central Pollution Control Board, India. NOx emissions will be controlled by precise regulation of the combustion process. SOx gas emissions are negligible since the sulphur content in rice husk is negligible.

Impact on Water Use:

The project is located near a water source which shall be utilized during the operation of the plant. However, RBPL shall harvest the rain water and augment the source of water supply. The rain water harvesting shall significantly reduce the impact on fresh water use.

Effluent Treatment:

The clear waste water effluent generated will be taken to a neutralizing pit and used for gardening, green belt development and for dust suppression spraying in the fuel yard. Boiler blow down hot water & cooling tower purge/blow down will be led to the ash handling system for ash handling & quenching. Excess treated wastewater will be discharged for irrigation purposes.

Ash Disposal:

Ash is comprised of fly ash collected from ESP collection system and air pre-heater hoppers and bottom ash collected from the furnace. The ash will be collected by a conveyor and transported for disposal. Water spray nozzles for dust suppression will be installed at the junctions with the ash transfer conveyor.

Noise:

Noise emitted from the biomass power plant will be within the allowable limits established which would be typically 75 dBA.

Impact on Ecology:

The project activity does not foresee any harmful impact on the ecology. There are no nearby forests, or zones high on biodiversity, or other environmentally sensitive locations around the factory that might be affected negatively due to the project. Further, no harmful impact shall be caused on the aquatic ecology as well as on the local vegetation.

The PP has obtained the Consent to establish the project activity from the Karnataka State Pollution Control Board.

D.2. Environmental impact assessment

As explained in section D.1, the biomass based projects does not fall under the project categories mentioned in schedule of EIA notification 14/09/2006 and subsequent amendments in EIA notifications, thus EIA is not required for the project activity. http://environmentclearance.nic.in/writereaddata/EIA_notifications/2006_09_14_EIA.pdf

All the necessary consents relevant to the project operation has been received and PP is adhered to all the compliance of the consents. Therefore, the environmental impacts are not considered significant.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

During the planning and design process of the project, RBPL, the project proponent identified the relevant stakeholders to be the Panchayat of Yedlapur Village, KREDL, KPTCL and Rice Mill owners in the region.

Subsequently, RBPL invited stakeholder meeting which was arranged at Nrupathunga Hotel, Amoga Hall near Yedlapur Village in Raichur District on May 18, 2012 from 4:00 to 6:00pm. In addition to the community stakeholders, RBPL intimated government officials of state government, KREDL, KPTCL and rice mill owners about the meeting.
The meeting purpose, date, venue and request to attend by all stakeholders were published in the local daily newspaper Raichur Vani on April 27, 2012.

Basically, the purpose of the stakeholders meeting was to present the benefits of the project activity to the environment, community and the region where the project is located, and to explain what CDM is and its processes, aims and benefits. The meeting wished to stress the conformity of the project in attaining the sustainable development goals of the country through an alternative and cleaner way of producing energy. More importantly, the meeting served as a venue for stakeholders to ask questions or give comments about the project activity and CDM.

E.2. Summary of comments received

The participants appreciated the initiative of RBPL to implement the 9MW Biomass Power Plant and all of the participants responded positively to the project.
A presentation was given by RBPL to the attendees and a brief on the project activity, its implementation programme, cost benefit, UNFCCC and CDM process, environmental issues, concerns and improvement commitment etc was highlighted.

The presentation was followed up by inviting comments and open discussions on the concerns raised by the participants. RBPL addressed all questions related to various aspects of the project.

The comments received from the participants pertained to the following aspects:

- Impact on local roads;
- Impact on environment;
- Rice husk procurement;
- Impact on cost and quality of electricity;
- Initiatives taken by company for creating local employment;

No other significant concerns were raised during the Stakeholders' Consultation meeting. Further, as prescribed by the UNFCCC, the PDD would be published at the validator's website for public comments.

E.3. Consideration of comments received

Impact on local roads:
The participants expressed concern over the fact that constant movement of biomass carrying vehicles would damage the existing connecting roads to the nearby communities. RBPL assured that the impact on local roads shall be contained by regularly carrying out maintenance work and the project shall make provisions to adopt the 3 kms of road that is connecting the project activity to the state highway.

Impact on the environment:
The participants expressed concern on the possible impact on the environment occurring from ash disposal and water flows in the river and the air quality. RBPL mentioned that the ash generated from the project activity will not have any impact on the environment as the project design allows for environmental-friendly management of ash. As regards the water flows, RBPL mentioned that the impact on existing water flows have been considered in the project design and 10% of the total discharge shall be continuously discharged during all seasons in order to ensure that the local ecology is not impacted. In regard to the air quality, RBPL mentioned that appropriate air pollution control systems shall be installed in the project activity and hence there shall be no negative impacts on the surrounding air quality.

Rice husk procurement:
RBPL mentioned that the project activity shall source all the rice husk requirements through an exclusive agreement with the rice mill owners in the region at mutually agreeable prices so that the current problem of rick husk disposal shall be taken care of. The participants suggested periodic

meetings for deciding on rice husk prices. The suggestion was accepted by RBPL and it was agreed to have a firm decision on the issue at the time of the start of the project activity.

Impact on cost and quality of electricity:
RBPL mentioned that the project envisages supply of electricity to the rice mill owners under the "Exclusive Consumers" category allowed by the Karnataka Power Transmission Corporation Limited (KPTCL). The company assured that RBPL shall supply electricity to the "exclusive consumers" at a price that shall be discounted from the price being paid by the "exclusive consumers".

Initiatives taken by company for creating local employment
RBPL mentioned that creation of local employment both during the construction and operational phases of the projects shall be of top priority. RBPL also mentioned that the company is willing to carryout training to upgrade the skill levels of local youth so that they could take part in the construction and operational phases of the project activities.

The stakeholder meeting concluded in favour to setup the proposed project activities and the stakeholders were happy to note that the project helps in the following aspects:

- Improvement of local roads;
- No impact on local environment;
- Assured Rice Husk procurement;
- Assured electricity at lower than the prevailing commercial rates;
- Employment opportunities
- Demonstration of electricity generation through use of renewable resources

SECTION F. Approval and authorization

No.	Approval and Authorization Details	Reference	Date of Approval / Authorization
1	Approval for land conversion from the District Comissioner, Raichur	No. S.K/ALN/2012-13/174/3433	04.12.2012
2	Host Country Approval from Ministry of Environment and Forests, Government of India	No. 4/15/2012-CCC	22.11.2012
3	Consent to Establish from Karnataka State Pollution Control Board	No. KSPCB/SEO (Non-EIA)/CFE/LR/2012-13/682	18.09.2012
4	Technical Clearance from Karnataka Renewable Energy Development Limited for Biomass Assessment Report and Project Implementation	Bio & Cogen: MAN:F-52:2012-12/1734	26/06/2012
5	No Objection Certificate from Yedlapur Gram Panchayat	No. G/P/Y 2012-13	21.06.2012
6	Approval of location from Karnataka Udyog Mitra, Government of Karnataka to establish 9MW capacity Biomass Power Project	No. KUM/SLSWCC/E-1(E-5)01-02/212/2011-12	13.03.2012
7	Approval from Government of Karnataka to establish 9MW Biomass Power Project	No. EN/427/NCE 2011,	16.01.2012

8	Approval from District Office, Raichur towards purchase of private land for the RBPL Biomass Power Project	No. LND/2011-12	12.12.2011
9	In-principle clearance from Energy Department, Government of Karnataka for setting up 9MW Biomass Power Project	No. DE 2 NCE 2001	18.08.2001

Appendix 1. Contact information of project participants

Organization name	Raichur Bio-energies Private Limited
Country	India
Address	Sy No. 136/1 A, 136/1B, 138/1,138/2,139/A,139/B,140/A & 140/B, Yedlapur Village, Behind KPCL, Raichur, Karnataka 584170
Telephone	00 91 8532 225 380
Fax	00 91 8532 225 380
E-mail	raichurbioenergies@gmail.com
Website	-
Contact person	Mr. Savitri Purushottam

Appendix 2. Affirmation regarding public funding

The PP Affirms no public funding from any Annex 1 country has been obtained for the project Activity.

Appendix 3. Applicability of methodologies and standardized baselines

The applicable approved baseline and monitoring methodology for the Project Activity is the AMS-I.D "Grid Connected Renewable Electricity Generation" (Version 17, EB 61) and has been referred from the approved methodologies for small-scale CDM project activities in the UNFCCC website viz., **http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html**.

The applicability of the selected methodology is provided in detail in Section B.2 of the PDD. No further information is added to the same.

Appendix 4. Further background information on ex ante calculation of emission reductions

The emission reductions are calculated using the CO2 Baseline Database for the Indian Power Sector, Version 7.0, January 2012 – Government of India, Ministry of Power, Central Electricity Authority. The salient aspects of the ex-ante calculations of emission reductions are provided in the following table:

Baseline Emission Factor Calculation					
1	Reference	CEA Database - Version 7.0 released January 2012			
2	Accessible at	http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm;			
3	Emission Factors Data (from CEA Database)	**Units**	**2008-09**	**2009-10**	**2010-11**
	Operating Margin	(in tCO2 / MWh	0.97	0.94	0.94
	Build Margin	(in tCO2 / MWh)	0.82	0.76	0.73
Emission Reduction Calculations					
4	Calculation Method	Combined Margin			
5	Data Vintage for Projection of Emission Reductions	For OM 2008-09, 2009-10 and 2010-11 (3 most recent years available at the time of PDD Validation)			
		For BM = 2010-11			
6	Data Vintage for Verification of Emission Reductions	Same as for Projection (emission factor fixed ex-ante)			
7	Weights for Combined Margin	OM = 50%			
		BM = 50%			

8	*Operating Margin*	0.95	tCO2 / MWh		
9	*Build Margin*	0.73	tCO2 / MWh		
10	***Combined Margin***	**0.84**	**tCO2 / MWh**		

Appendix 5. Further background information on monitoring plan

The details of the monitoring plan are provided in Section 7 of the PDD. No further information is added in the Appendix.

Appendix 6. Summary report of comments received from local stakeholders

The participants appreciated the initiative of RBPL to implement the 9MW Biomass Power Plant and all of the participants responded positively to the project.
A presentation was given by RBPL to the attendees and a brief on the project activity, its implementation programme, cost benefit, UNFCCC and CDM process, environmental issues, concerns and improvement commitment etc was highlighted.

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- Impact on environment;
- Rice husk procurement;
- Impact on cost and quality of electricity;
- Initiatives taken by company for creating local employment;

No other significant concerns were raised during the Stakeholders' Consultation meeting. Further, as prescribed by the UNFCCC, the PDD would be published at the validator's website for public comments.

Appendix 7. Summary of post-registration changes

The below post registration changes are requested in the PDD-

PRC Category: Changes to the start date of the crediting period

- The project activity commissioning was delayed, thus justification regarding that is mentioned in PDD along with commissioning date. Thus change in start date of crediting period from 01/04/2014 to 01/02/2016 is requested due to delay in commissioning

PRC Category: Corrections

- Section A.6 is revised as per template requirement.
- Appendix 1 has been revised.
- Section C.3.2 is revised with start date of crediting period as 01/02/2016

PRC Category: Permanent changes to the registered monitoring plan

- The parameter "Percentage of moisture in biomass residue (wet basis) "has been kept as ex-ante monitoring parameter instead of ex-post monitoring parameter. As per monitoring methodology AMS I.D "The moisture content of biomass of homogeneous quality shall be determined ex ante. The weighted average should be calculated and used in the calculations"
- The source for NCV of coal has been revised to IPCC default values. Since values are not provided by fuel supplier in Invoices, IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provide in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is used as source for NCV of coal. The value for NCV of coal is revised from 3,500 kCal/kg to 32.2 TJ/Gg based on IPCC default values at the upper limit of the uncertainty at a 95% confidence interval.
- The default value of parameter "Default CO2 emission factor for coal " has been changed from 98,300 Kg/TJ to 101,000 Kg/TJ at the upper limit of the uncertainty at a 95% confidence interval as provide in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. This is conservative value.
- As per methodological tool "Project and leakage emissions from biomass" version 4, para 33 "Small scale project activities may, unless otherwise required by the methodology, neglect this source of emissions if the transportation distance is less than 200 km". For project activity, the biomass transportation is within 200 Km, hence project emissions are not applicable for the project activity. The biomass transportation distance will be monitored and if that distance is more than 200 Km, below methodological tool to be followed. The PDD relevant section are updated regarding project emissions due to fossil fuel consumption due to transportation of biomass

Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.

Version	*Date*	*Description*
04.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

Decision Class: Regulatory
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