Project design document form for CDM project activities

(Version 05.0)

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	20 MW Biomass Power Project at Godawari Power and Ispat Limited, Chhattisgarh
Version number of the PDD	3.1
Completion date of the PDD	08/10/2015
Project participant(s)	Godawari Power and Ispat Limited
Host Party	India
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope: 01- Energy Industries (renewable / non-renewable sources) ACM0018 (Version 03.0) – “Electricity generation from biomass residues in power-only plants”
Estimated amount of annual average GHG emission reductions	107,509 tCO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Godawari Power and Ispat Limited (GPIL) has installed a 20 MW biomass based power project at Siltara, Raipur. The purpose of the project activity is to generate electricity using renewable biomass residues i.e. rice husk to reduce GHG (CO_2) emissions. As biomass is a CO_2 neutral fuel, the power produced by the GPIL from renewable biomass will have zero GHG emissions. Also as it is replacing fossil fuel intensive based power generation from NEWNE grid, thereby results in reducing emissions from such fossil fuels. In the project activity, biomass shall be combusted in the boiler for producing high pressure steam to generate 20 MW electricity. The total annual generation of electricity from project activity will be 126.72 GWh. The rice husk will be collected from a radius of 50 km from project site. The project has obtained the requisite clearances and is commissioned on 01 November 2010.

Prior to the start implementation of the project activity, there are four power-only plants at the project site i.e. 11 MW coal/dolo char based power only plant and three waste heat recovery based power only plants (7 MW, 10 MW and 25 MW) located at the project site. Out of the four power only plants at the project site, three power only plants i.e. 11 MW coal/dolochar based power plant, 7 MW waste heat recovery based power plant and 10 MW waste heat recovery based power plant are connected to the proposed project activity through common steam header. Another 25 MW waste heat recovery based power plant is not connected with the steam header of this project activity. However, it is altogether an independent power generation activity with its own boilers and turbogenerator. All the four power only plants will continue to operate after the start of this project activity.

The primary technology for the project activity is direct combustion of rice husk, and power generation using the Rankine cycle technology. Power generation through this method involves combustion of rice husk directly in the boiler, with generation of steam, which is fed to a steam turbine that drives the generator. The baseline scenario identified is import of electricity from grid and leaving biomass residues to naturally decay or burning in an uncontrolled manner.

Govt. of India has stipulated the following indicators for the sustainable development in the interim approval guidelines for Gold Standard projects. The project participant has studied each of the above indicators in the context of the project activity to ensure that the project activity contributes to sustainable development.

Social and Economic wellbeing: The project would lead to generation of direct and indirect employment and improving economic condition of the area. The project activity adds income to the farmers by providing added economic value to the produce of farmers by procuring rice husk from the rice mills. This will definitely help the millers to pay better price to the farmers for their paddy crop.

Since the biomass resources are to be collected and transported to the plant site from the fields, opportunities are being generated for the rural people to collect and transport the biomass residues. The rice husk transportation to site will provide employment opportunities to a number of trucks and other similar vehicles will be making trips to project site throughout the year. This will increase the transport related income and employment.

The above benefits due to the project activity ensure that the project would contribute to social and economic wellbeing in the region.

Environmental wellbeing: The project activity utilizes biomass potential available for power generation, which otherwise is left unutilized (left to decay or burnt). Thus it aids in the resource utilization and avoids pollution due to burning / dumping of biomass in nearby areas. Further, project activity replaces part of power generated in the grid using predominantly fossil fuels such as coal, lignite and gas. The project would not result in increase of GHG emissions and cause no negative impact on the environment.

Technological wellbeing: Successful implementation of this project would encourage other promoters to adopt similar technology in the relevant sector and hence the project leads to technological wellbeing.

In view of the above, the project participants consider that the project activity strongly contributes to sustainable development in the host country. Thus, the host country DNA has awarded LoA to the project activity on 17/03/2010.

A.2. Location of project activity

A.2.1. Host Party

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India

A.2.2. Region/State/Province etc.

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Chhattisgarh

A.2.3. City/Town/Community etc.

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Siltara/District Raipur

A.2.4. Physical/Geographical location

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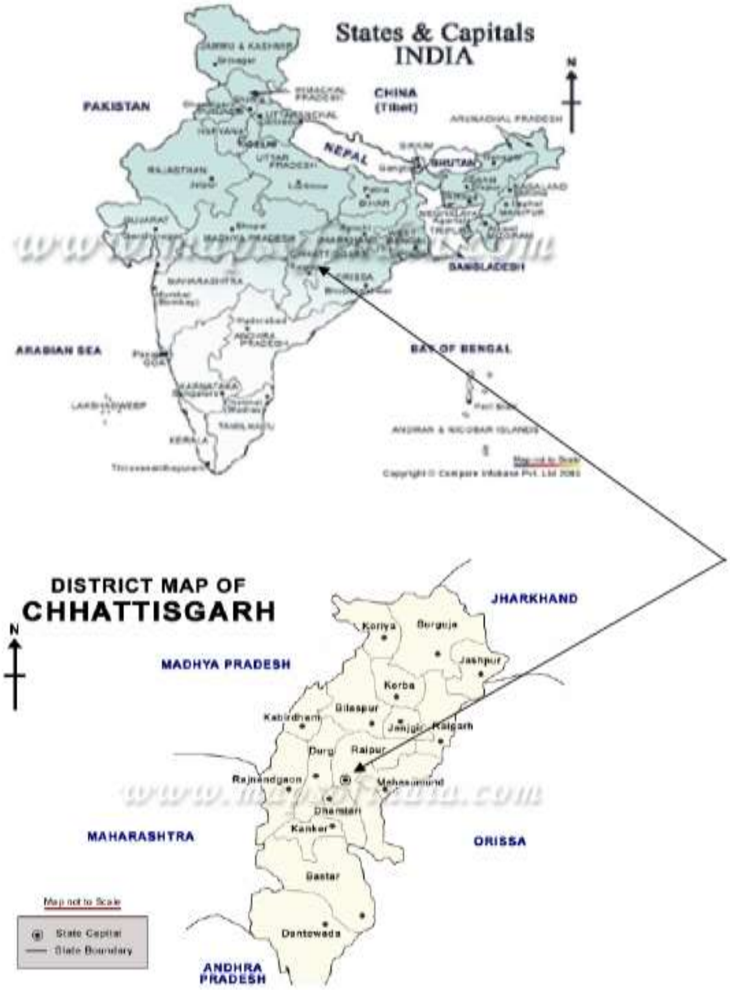
Within the existing premises of Godawari Power & Ispat Limited (Previously known as Ispat Godawari Ltd.), Phase –I, Siltara Industrial Area, Bilaspur Road, Siltara, Raipur District, Chhattisgarh State, India Longitude 81°41'5"E Latitude 21°22'24"N nearest Railway Station : 17 Km, Raipur



A.3. Technologies and/or measures

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Technology description

The primary technology for the project activity is direct combustion of rice husk, and power generation using the Rankine cycle technology. Power generation through this method involves combustion of rice husk directly in the boiler, with generation of steam, which is fed to a steam turbine that drives the generator. The technology used in environmentally safe and sound.

The main elements of the power plant are as follows.

- A new boiler unit which converts the energy available in the fuels into thermal energy;
- Refurbished steam turbine units which convert thermal energy into mechanical energy;
- Alternator units, which convert mechanical energy into electrical power.

Other equipment, as listed below, also form part of the biomass power plant.

- Fuel and ash handling equipment
- System for cooling the exhaust steam
- DM Water system and Air Compressor Plant
- Electrical systems and Automation system

The project activity involves installation of new boiler units and refurbishment of existing turbine units for the generation of 20 MW electricity. The technical lifetime of boiler is 20 years. But the residual life of the refurbished turbine is 18 years. Hence the operational lifetime of the project activity is 18 years.

The project design parameters are furnished in the **Table 1**.

The capacity of the turbo generator is 20 MW, which generates electricity at 33/11 kV level. It is anticipated that the plant can operate at a plant load factor of 80%. Average annual estimate of electricity generated by the project activity is 126.72 GWh. The existing capacity at project site is 28 MW and the forecast capacity is 48 MW after implementation of 20 MW Biomass based project activity. The efficiencies and load factors of various equipments along with the Heat and Mass Balance for all the equipments in the project boundary are provided in section B.3.

Table 1: Technical details of the project activity

Equipment:	Boiler
Type	Semi outdoor, natural circulation, single drum, balance draft, Atmospheric Fluidised Bed (AFB) boiler with convective heat recovery surfaces for super heaters, economizers and tubular air heaters.
Nominal Capacity	Adequate to supply steam to the corresponding TG sets.
Pressure Kg/Sq.cm (A)	35
Temperature (^{o}C)	410+/ - 5^{o}C
Steam flow at MCR (T/hr.)	100 T/hr
Steam temperature control range	60 - 100% MCR or better
Feed water temperature at inlet of economizer Deg. C	105
Tubular Air heaters	1x 100%
Induced Draft fans	2 x 100% capacity radial ID fans with variable frequency drive.
Primary air fans	2 x 100% capacity
Force Draft fans	2 x 100% capacity with variable frequency drive.
Electrostatic Precipitator	Multi-field, multi-path electrostatic type suitable for limiting dust emission 50 mg/Nm^3 at outlet with one field out of service.
Firing System	Fluidized bed combustion system
Ash removal	i. Bottom Ash: Bottom ash discharged in dry form from the furnace will be conveyed to the ash storage silo by pneumatic conveyor system. ii. Fly Ash: Extracted in dry condition through vacuum and pressurized air conveying system to ash storage silo for the ultimate disposal for backfilling of mined-out areas.

Equipment Name:	Turbine 1, 2, 3 and 4
Type	Condensing, steam turbine directly coupled to 3000- RPM, 2- pole, 50 Hz, electric power generator.

Normal capacity	Refurbished TG 1 (10 MW) and Refurbished TG 2 (10 MW), Existing TG 3 (10 MW) and Existing TG 4 (30 MW) respectively
Normal operating frequency range	47.5 to 51.5 Hz
Pressure (kg/sq. cm)	35
Temperature (^oC)	410 +/- 5^oC
Steam flow at MCR (T/hr.)	100 tonnes/hr.
Exhaust pressure	0.1 kg/cm^2 (A)
Type of governing	Electro-hydraulic with fire resistant fluid (FRL).
Condensing Equipment	Water cooled surface condenser
Regenerative feed heating	Heaters of varying capacities for TGS.
Boiler feed pumps	2 x 100% capacity high speed BF pumps.
Condensate extraction pumps	2 x 100% capacity, electric motor driven vertical pumps of CAN type.

Equipment Name:	Generator 1, 2, 3 and 4
Type	3000- RPM, 2- pole, 50 Hz, electric power generator.
Normal capacity	Existing Generator 1 (10 MW) and Generator 2 (10 MW), Existing Generator 3 (10 MW) and Generator 4 (30 MW) respectively
Normal operating frequency range	47.5 to 51.5 Hz

Table 2 Heat and Mass Balance for all the equipments in the project boundary

11MW AFBC Boiler (Efficiency: 80%)					
Heat Input	15,048	KJ/KG	Heat output	2,758.8	KJ/KG
Mass of Fuel/day	385,000	KG	Mass of Steam/day	1,680,000	KG
Total Heat per day	5,793,480	MJ	Total Heat per day	4,634,784	MJ
7 MW WHRB-1 Boiler (Efficiency: 81.87%)					
Heat Input	3100	KJ/KG	Heat output	2,758.8	KJ/KG
Mass of Heat/day	782,608.6	KG	Mass of Steam/day	720,000	KG
Total Heat per day	2,426,086.9	MJ	Total Heat per day	1,986,336	MJ
10 MW WHRB-2 Boiler (Efficiency: 81.87%)					

Heat Input	3,100	KJ/KG	Heat output	2,758.8	KJ/KG
Mass of Heat/day	1,408,695.6	KG	Mass of Steam/day	1,296,000	KG
Total Heat per day	4,366,956.5	MJ	Total Heat per day	3,575,404.8	MJ
20 MW AFBC 2 Boiler (Efficiency: 81.73%)					
Heat Input	14,212	KJ/KG	Heat output	2,758.8	KJ/KG
Mass of Fuel/day	570,000	KG	Mass of Steam/day	2,400,000	KG
Total Heat per day	8,100,840	MJ	Total Heat per day	6,621,120	MJ

TG-1 10MW (Efficiency: 30.48%)					
Heat input	2,758.8	KJ/KG	Heat output	841	KJ/KG
Mass of Steam/day	1,320,000	KG	Mass of Steam/day	1,320,000	KG
Total Heat per day	3,641,616	MJ	Total Heat per day	1,110,120	MJ
TG-2 10MW (Efficiency: 30.48%)					
Heat input	2,758.8	KJ/KG	Heat output	841	KJ/KG
Mass of Steam/day	1,320,000	KG	Mass of Steam/day	1,320,000	KG
Total Heat per day	3,641,616	MJ	Total Heat per day	1,110,120	MJ
TG-3 10MW (Efficiency: 30.74%)					
Heat input	2,758.8	KJ/KG	Heat output	848	KJ/KG
Mass of Steam/day	1,248,000	KG	Mass of Steam/day	1,248,000	KG
Total Heat per day	3,442,982.4	MJ	Total Heat per day	1,058,304	MJ
TG-4 30MW (Efficiency: 31.21%)					

Heat input	2,758.8	KJ/KG	Heat output	861	KJ/KG
Mass of Steam/day	3,384,000	KG	Mass of Steam/day	3,384,000	KG
Total Heat per day	9,335,779.2	MJ	Total Heat per day	2,913,624	MJ

Training is required to be provided to the operators handling the operation of the critical equipment such as Boiler and Turbine. The company had taken necessary precautions to get the operators of these two equipment trained by the suppliers of their equipment. The company has recruited personnel with relevant experience in the operation of the boiler and turbine. Certified boiler operators are employed for handling boiler operations. Further, suppliers of turbine and boiler provided initial training on the operation of the boiler and turbine. Confirmation on provision of training from the equipment supplier will be provided to the DOE.

Technology Transfer
No technology is transferred from Annex I countries for this Gold Standard project activity.

The Monitoring equipment and their locations are described as under in the schematic diagram below

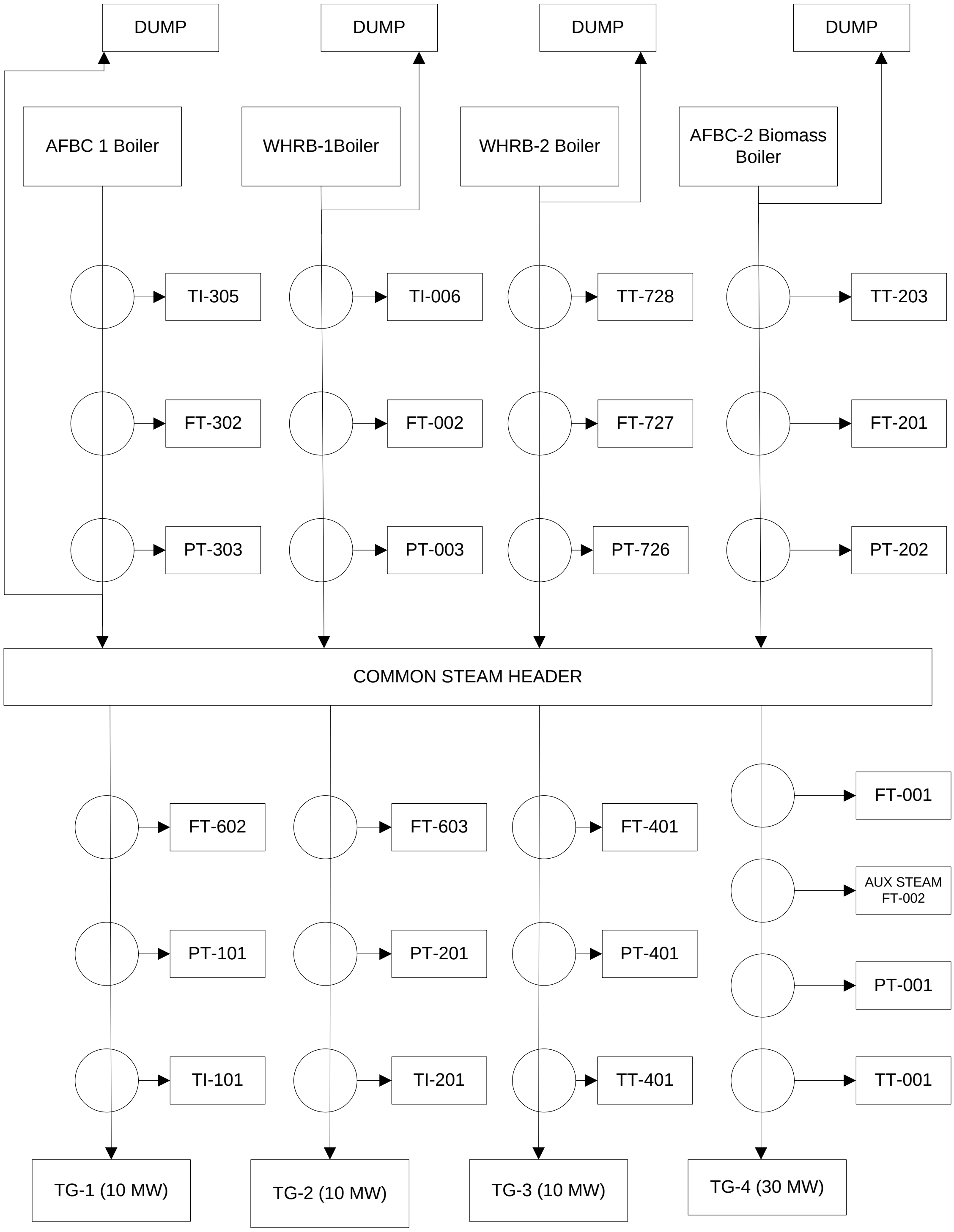

Figure 1: Schematic Diagram of Monitoring Equipment and their locations

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	Private Entity: Godawari Power and Ispat Ltd.	No

A.5. Public funding of project activity

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The project activity is funded by equity and in part by debt from banks. There is no public funding from Annex I countries in this project activity.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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ACM0018 (Version 03.0) – “Electricity generation from biomass residues in power-only plants”
EB 76, Annex 09

Version 07.0.0 “Tool for the demonstration and assessment of additionality”

Version 02 “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf;

Version 06.0.1 “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site”

Version 01 “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”

Version 04.0 “Tool to calculate the emission factor for an electricity system”

B.2. Applicability of methodology and standardized baseline

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A description of the applicability requirements of ACM0018 and how the project activity meets the applicability conditions is presented below:

This methodology applies to project activities that generate power using biomass as fuel, optionally combining with solar thermal power generation. The project may be a Greenfield, capacity expansion or fuel switch project.
The proposed project involves the installation of a new biomass residues (co-) fired power-only plants at a site (without using solar thermal technology). The project activity uses a new boiler and refurbishing two existing turbines. However, the boiler being new and additional 20 MW electricity generation due to the project from existing TGs happening under the project activity, this project activity plant is taken as new. This will not impact emission reduction due to leakage (in case project/ owner of existing TG from where TG is transferred to be refurbished and used under project activity switches to fossil fuel because the TG was lying idle with PP). Also, as PP will take cost of TG purchase and refurbishment cost only, additionality will also be conservatively demonstrated. Further, in line with the methodology deviation (M-DEV-0485) approved for the project, the applicability condition is met.

	Applicability Condition	Project Case
1	This methodology is applicable to project activities that generate electricity in biomass residue (co-) fired power-only plants, optionally combining with electricity generation using solar thermal technology. The project activity may include the following activities or, where applicable, combinations of these activities: (a) The installation of new biomass residues (co-)fired power-only plants at a site where currently no power generation occurs (Greenfield power projects); (b) The installation of new biomass residues (co-)fired power-only plants, which replace or are operated next to existing power-only plants fired with fossil fuels and/or biomass residues (power capacity expansion projects); (c) The improvement of energy efficiency of existing biomass residues (co-)fired power-only plants (energy efficiency improvement projects), which can also lead to a capacity expansion, for example by retrofitting the existing plant; (d) The total or partial replacement of fossil fuels by biomass residues in an existing power-only plant or in a new power-only plant that would have been built in the absence of the project (fuel switch projects), for example by increasing the share of biomass residues use as compared to the baseline, by retrofitting an existing plant to use biomass residues, etc.; (e) The installation of biomass residues (co-)fired power-only plants which include solar thermal power generation by sharing the power generation equipment between the biomass and solar components at a site where currently no power generation using solar thermal technology occurs (either as Greenfield or power capacity expansion project).	As discussed above this table, a methodology deviation (M-DEV-0485) is approved for the project activity from this condition. Thus, condition is not relevant.
2	The biomass residues used in the project activity may be produced on-site (e.g. if the project activity is based on the operation of a power plant located in an (agro-) industrial plant generating the biomass residues), or they can be obtained off-site from the nearby area, specific suppliers or purchased from a market.	The biomass residues used in the project activity are purchased from market in nearby area. Thus, the condition is met.

3	The methodology is applicable under the following conditions: a) No other biomass types than biomass residues, as defined above, are used in the project plant b) Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired shall not exceed 80% of the total fuel fired (i.e. fossil fuels and biomass) on an energy basis c) For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process d) The biomass residues used by the project facility should not be stored for more than one year e) Projects that chemically process the biomass residues prior to combustion (e.g. by means of esterification, fermentation and gasification) are not eligible under this methodology. The biomass residues can however be processed physically such as by means of drying, pelletization, shredding and briquetting f) No power and heat plant operates at the project site during the crediting period g) If any heat which is used for purposes other than power generation is generated during the crediting period or was generated prior to the implementation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the following conditions should apply: (i) The implementation of the project activity does not influence directly or indirectly the operation of the heat generation equipment, i.e. the heat generation equipment would operate in the same manner in the absence of the project activity; (ii) The heat generation equipment does not influence directly or indirectly the operation of the project plant (e.g. no fuels are diverted from the	a) The fuel used in the Project is rice husk, which is agricultural waste from rice mills. This is not including municipal waste or other wastes that contain fossilized and/or non-biodegradable material. So the rice husk meet the definition of biomass residues, and there is no other biomass types used. b) There are no fossil fuels co-fired in the Project activity. c) The biomass residue (rice husk) is derived from rice mills within a radius of 50 km from the Project site. Availability is surplus for the implementation of the Project and hence will not influence the plan of these crops planting d) The Project activity will plan to set up storage site, and the biomass residues will not be stored for long (more than a year). The monthly inventory records of the rice husk procured and used in the project activity will ensure this condition. The project owner will only purchase the fresh biomass residues, and the store period in collection site will not be longer than one year. Furthermore, the storage capacity of power plant is not more than to satisfy, only 45-50 days fuel consumption. Therefore, it is a remote possibility that the storage period of biomass residues in the storage located in the power plant could exceed to more than one year. e) The biomass residues are not chemically processed prior to the combustion. The biomass residues will be transported directly to the project site. Therefore, main energy demand of the Project is transportation of biomass residue f) According to GPIL, the Project has no intention to produce heat during the whole project lifetime. All heat engines of power plant will produce power and do not co-generate heat. The thermal energy produced in the boilers of the power plant is only used in turbines and not for other processes. g) There is no heat generation prior to the implementation of the Project as well as during the life of the project

	heat generation equipment to the project plant); and (iii) The amount of fuel used in the heat generation equipment can be monitored and clearly differentiated from any fuel used in the project activity h) In the case of fuel switch project activities, the use of biomass residues or the increase in the use of biomass residues as compared to the baseline scenario is technically not possible at the project site without a capital investment in: (i) The retrofit or replacement of existing heat generators/boilers; or (ii) The installation of new heat generators/boilers; or (iii) A new dedicated biomass residues supply chain established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that could otherwise not be used for energy purposes); (iv) Equipment for preparation and feeding of biomass residues	h) The project is a new biomass based power generation project and not a fuel switch project activity.

4	Finally, the methodology is only applicable if the most plausible baseline scenario, as identified per the "Procedure for the selection of the baseline scenario and demonstration of additionality" section hereunder, is: (a) For power generation: Scenarios P2 to P7, or a combination of any of those scenarios; (b) For biomass use: Scenarios B1 to B8, or a combination of any of those scenarios. However, note that for scenarios B5 to B8, leakage emissions should be accounted for as per the procedures of the methodology.	As analyzed in section B.4, P5, B1 & B3 is indentified as the most plausible baseline scenario to the proposed project.

As all the applicability conditions are met, the baseline methodology ACM0018 is applicable to the proposed project.

B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Grid Electricity Generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	Excluded for simplification. CH_4 emissions from uncontrolled burning or decay of dumped biomass residues are highly uncertain and difficult. In addition, excluding the CH4 emissions in the baseline is conservative, since it results in lower amount of emission reductions
		N_2O	Excluded	Excluded for simplification
Project scenario	fossil fuel consumption due to the project activity (Stationary or mobile)	CO_2	Included	An important emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Combustion of biomass residues for electricity generation	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	On-site and Off-site transportation and processing of biomass residues	CO_2	Included	An important emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Waste water from the treatment of biomass residues	CO_2	Excluded	It is assumed that CO_2 emission from surplus biomass residue do not lead to change in carbon pool in the LULUCF sector.
		CH_4	Excluded	Waste water is not treated under anaerobic conditions
		N_2O	Excluded	Excluded for simplification

B.4. Establishment and description of baseline scenario

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According to the latest methodology ACM0018, the following four steps should be used to identify the most plausible baseline scenario and demonstrate additionality.

STEP 1. Identification of alternative scenarios
STEP 2. Barrier analysis
STEP 3. Investment analysis (If applicable)
STEP 4. Common practice analysis.

STEP 1. Identification of alternative scenarios
This step serves to identify all alternative scenarios to the proposed Gold Standard project activity(s) that can be the baseline scenario through the following sub-steps:

Sub-step 1a. Define alternative scenarios to the proposed Gold Standard project activity

Realistic and credible alternatives should be separately determined regarding:

- How power would be generated in the absence of the Gold Standard project activity;
- What would happen to the biomass residues in the absence of the project activity;

For power generation, the baseline alternative scenarios are listed and discussed as follows:

The alternative scenarios for electric power should include, inter alia:

	Alternative baseline scenarios	Include?	Explanation
P1	The proposed project activity not undertaken as a Gold Standard project activity;	Yes	This alternative is a plausible scenario before investment analysis.
P2	If applicable, the continuation of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The existing power-only plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the project activity	No	The continuation of the power generation in existing power only plants fired with fossil fuels and waste heat/ gas in steel production plant is not a feasible option as the project proponent has envisaged expansion in the steel manufacturing processes and there is a need for additional 20 MW of electricity in the processes. Hence this cannot be considered as a plausible alternative scenario.
P3	If applicable, the continuation of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The existing power-only plants would operate with different conditions from those observed in the most recent three years prior to the project activity	No	The continuation of the power generation in existing power only plants fired with fossil fuels and waste heat/ gas in steel production plant is not a feasible option as the project proponent has envisaged expansion in the steel manufacturing processes and there is a need for additional 20 MW of electricity in the processes. Hence this cannot be considered as a plausible alternative scenario.
P4	If applicable, the retrofitting of existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The retrofitting may or may not include a change in fuel mix	No	The proposed project activity is the installation of a new biomass based power generation activity. There is no retrofit of the existing power only plants fired with fossil fuels and waste heat/ gas in steel production plant, or a combination of both, at the project site.

			There will also not be any possibility of retrofitting in the existing AFBC boiler based Power Plant.
P5	The generation of power in the grid;	Yes	This is a realistic alternative scenario at the project site.
P6	The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using the same amount or less biomass residues than under scenario P1	No	Generating the similar amount of electricity by using less or more biomass residues represents using higher efficiency or lower efficiency technology compared with the technology applied to the project. The alternative baseline scenario to construct a fossil fuel fired power plant of generating the same amount of electricity would have an installed capacity of 20 MW. However, fossil fuel fired plant is strictly prohibited in the region according to current regulations of Chhattisgarh Renewable Energy Development Authority and State Pollution Control Board. Therefore, the installation of new power-only plants fired with fossil fuels is not applicable. Therefore, P6 is excluded.
P7	The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using more biomass residues than under scenario P1	No	Furthermore, the installation of a new biomass residue fired power plant with more biomass residues will increase the operation cost and is not a viable option due to problems in sourcing biomass throughout the year. According to the clearance received from Chhattisgarh Renewable Energy Development Authority and the State Pollution control board, it is not allowed to co-fire fossil fuel for new built biomass power generation project. Therefore, it is impossible to build new co-fire biomass residue and fossil fuel power plants. Therefore, P7 is excluded.

Therefore, scenarios P1 and P5 are plausible baseline scenarios which need further discussion. For the use of biomass residues, according to ACM0018, it is necessary to explain and document which quantities of which biomass residues categories are used in which installation(s) under the project activity and what is their baseline scenario. So, based on the DPR of the proposed project, the biomass residues categories are listed as follows:

Table 3: Biomass residues categories of the project activity

Biomass residues type	Biomass residues source	Biomass residues fate in the absence of the project activity	Biomass residues use in the project scenario	Biomass residues quantity(tonnes)

Rice husks	Offsite from rice mills	Dumped (B1)	Electricity generation on-site (biomass only boilers)	See biomass availability assessment table below
Rice husks	Offsite from rice mills	Burnt in uncontrolled manner(B3)	Electricity generation on-site (biomass only boilers)	See biomass availability assessment table below

For the use of biomass residues, the alternative scenarios for biomass residues should include, inter alia:

Table 4: Define alternatives for the use of biomass residues

	Alternative baseline scenario	Include?	Explanation
B1	The biomass residues are dumped or left to decay mainly under aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields;	Yes	The biomass residues are currently dumped or left to decay under mainly aerobic conditions and burned in an uncontrolled way outside in the fields. For considering the availability of a surplus of biomass residues, this alternative will be furthermore discussed below this table.
B2	The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to landfills which are deeper than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields;	No	There is no deep landfill with more than 5 meters around the site of the proposed project, Moreover, a landfill would result in a large investment and ongoing operation costs and this is therefore unlikely to occur given the current situation of decay and burning.
B3	The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes	Yes	The biomass residues are currently dumped or left to decay under mainly aerobic conditions and burned in an uncontrolled way outside in the fields. For considering the availability of a surplus of biomass residues, this alternative will be furthermore discussed below this table. B3 is a realistic situation for the project.
B4	The biomass residues are used for electricity generation in power-only plant configuration at the project site in new and/or existing power plants;	No	There is no power generation project at the project site that uses biomass residues as fuel except the proposed project. However, biomass residues are available in abundance. In addition the proposed project utilizes biomass residues for electricity generation. However, without Gold Standard revenue, the cost of power generation of the proposed project is very high. The proposed project is faced with financial barrier. Hence B4 is not a plausible alternative scenario.
B5	The biomass residues are used for power and/or heat generation in	No	There is no power generation or heat generation project using biomass

	other existing or new power plants at other sites;		residues as fuel near the project site. Considering the cost of biomass transportation, other existing or new grid-connected power plants will not use the surplus biomass residue. Alternative B5 is not realistic.
B6	The biomass residues are used for other energy purposes, such as the generation of biofuels;	No	The technology of using Biomass for energy purpose, such as the generation of biofuels, is still in the starting phase, which is not common practice in India. Moreover, there are no existing facilities which use biomass residues for other energy purposes near the project site. Alternative B6 is not a realistic alternative scenario for the use of biomass residues.
B7	The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry);	No	There is no other industrial use of rice husk for non-energy purposes at project site, and the biomass consumption of the Project is from the local surplus/available biomass residues of the area according to the statistic. There is no fertilizer and feedstock factory which raw and processed materials are biomass residues, B7 is not realistic.
B8	The primary source of the biomass residues and/or their fate in the absence of the project activity cannot be clearly identified.	No	The source of the biomass residues is clearly identified in **Table 3**. Therefore, B8 is excluded.

A detailed biomass assessment study has been conducted in the region for a radius of 50 km around the project activity prior to the project conceptualization, which confirms the surplus biomass residues available in the region and assures the continuous availability of surplus biomass for the project. In order to demonstrate B1 and B3 are realistic and credible alternative scenario, one of the procedures described in the ACM0018 should be applied:

(1) Demonstrate that there is an abundant surplus of the type of biomass residue in the region of the project activity which is not utilized. For this purpose, demonstrate that the quantity of that type of biomass residues available in the region is at least 25% larger than the quantity of biomass residues of that type which is utilized in the region (e.g. for energy generation or as feedstock), including the project plant;

Option (1) is chosen to demonstrate the realistic and credible alternative scenarios, even taking a 50 km to the project site as radius, rice husk supply could be satisfied with the demand of a 25% larger in quantity. The following table demonstrates it in detail:

Table 5 Biomass (rice husk) availability assessment in Raipur district

Sl No.	Gen in MT/year	Consumption in MT/year						Surplus in MT/year
		Within Rice Mills	Power Plants	Solvent Plant	Brick Kilns	Poha Mills	Total Consumption MT/year	
1	735,029	215,031	252,450	61,050	9,960	3,400	541,891	193,138

It is obvious that the surplus quantity of rice husk is far more than the quantity of which utilized in the region including the project plant.

Outcome of step 1a:
the plausible alternative scenarios are P1 and P5 for the power generation and B1and B3 for biomass residues.

Sub-step 1b: Consistency with mandatory applicable laws and regulations:
In this sub step, alternative which is not compliance with laws and regulations will be excluded.
P1 and P5 is in compliance with all mandatory laws and regulations.

B1 is realistic and credible biomass alternatives for the Project, which is common practice in the region. In addition, there are no mandatory laws and regulatory requirements about the utilization of the biomass residues in India today. So without the proposed project, a huge amount of husk is left unused (dumped or left to decay or burnt in an uncontrolled manner) in Chhattisgarh state annually.

B3 is in compliance with all mandatory laws and regulations in India.

Outcome of step 1b: the plausible alternative scenarios are compliance with laws and regulations: P1, P5 and B1, B3.

Combined Scenario	For Electricity Generation	For biomass residues
1	P1: The proposed project activity not undertaken as a Gold Standard project activity	B1 and B3: The biomass residues are dumped or left to decay mainly under aerobic conditions; The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes
2	P5: Generation of electricity in the grid	B1 and B3: The biomass residues are dumped or left to decay mainly under aerobic conditions; The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes

STEP 2. Barrier analysis

There are no barriers identified that would prevent the implementation of either of the two alternative scenarios above. Therefore, neither of the two combined scenarios is eliminated by the step 2. The two combined scenarios need to be further discussed in Step 3.

STEP 3: Investment analysis.
The objective of Step 3 is to compare the economic or financial attractiveness of the alternative scenarios by conducting an investment analysis.

According to the ACM0018, this PDD will use the Benchmark to analyze whether the proposed project activity is less economically or financially attractive than the alternatives without the revenue from CER.

The investment analysis is conducted in the following steps:

Sub-step 3a. Determine appropriate analysis method
The “Tool for the Demonstration and Assessment of Additionality” recommends three analysis methods including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III) under sub-step 3b.

The proposed project activity generates financial and economic benefits through the use of electricity for the captive requirements in the steel production process, other than Gold Standard-related income and the selected baseline does not involve any investment. Hence a simple cost analysis or an investment comparison analysis does not apply and a benchmark analysis has been conducted.

Sub-step 3b. Apply benchmark analysis.

The project adopts this WACC benchmark rate for comparing the financial indicators of the project activity. Accordingly, project specific parameters have not been used for the calculation of the benchmark. The WACC has been derived based on standard market parameters and cost of capital of listed private sector companies operating in the power sector. The benchmark WACC has been calculated as the weighted average cost of equity and cost of debt.

Weighted average cost of capital (WACC) is calculated as weighted average cost of equity and cost of debt as illustrated below:

WACC = [D/ (D+E)]*[Cost of Debt] + [E/ (D+E)]*[Cost of Equity]

Where D – Debt, E – Equity

The required rate of return on equity for the project has been calculated using guidance 13 of Annex 5 of EB 62,
*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.*
Since the project activity can be developed by any other entity, ROE is calculated based on the standard parameters in the market.

As per guidance 15 of Annex 5 of EB 62,
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) 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.

As per the above guidance PP has used option (a) i.e. default values as provided in the Appendix A. The project activity belongs to sectoral scope 1 i.e. Energy Industries and thus falls under Group 1. The real term value of ROE for group 1 projects of India is 11.75%. As per guidance 7 of Appendix A, the nominal value can be converted to real term value by adding target inflation rate provided by central bank. Therefore, the real term value of ROE has been converted to the nominal term by adding inflation rate forecasted by RBI for year 2008-09 which is 7%[1]. The ROE is 18.75%.

The cost of debt is represented by the Benchmark Prime Lending Rate (BPLR) of the nationalised banks providing debt funding to the proposed project activity i.e. 11.75% and may conservatively be taken as the expectation of debt providers from the project activity. However, it is to be noted that returns equivalent to interest rate are not adequate enough to satisfy creditors because a sufficient cushion has to be considered so as to provide a margin for adverse developments. Thus, to ensure investment in the project debt creditors require adequate project returns well above the lending rate. However, for benchmark calculations, the lending rate has been chosen as the cost of debt as a conservative measure. Further, the cost of debt has been adjusted by the corporate tax rate of 33.66% as required by the definition of WACC. The benchmark (WACC) for the project thus works out to be 14.37%.

Sub-step 3c. Calculation and comparison of financial indicators.

[1] http://rbi.org.in/scripts/BS_PressReleaseDisplay.aspx?prid=18886

The cost of the project has been estimated at Rs. 799.26 millions for establishment of the project activity. The investment is funded by way of term loan to an extent of Rs. 487.31 millions and the balance in the form of equity.

Key input parameters for calculation of Investment Analysis

Project Cost (Rs. millions)	799.26	DPR
Means of Finance (Rs.in millions) - Share Capital - Term Loan	 311.95 487.31	DPR
Plant Capacity (MW)	20	DPR
Plant Load Factor (%)	80	DPR/CSERC
Auxiliary consumption (%)	10	DPR/CSERC
Anticipated energy generation	126.72	DPR
Type of fuel	Rice husk	DPR
Biomass price (Rs. Per tonne)	1,100	DPR
Escalation of biomass price (%/ annum)	5	DPR/CSERC
Administrative, O&M expenses (%/annum)	7	DPR/CSERC
Escalation of O&M (%/annum)	5	DPR/CSERC
Book Depreciation(SLM)	Building @ 3.34%, Plant & Machinery @5.28%/annum	IT Act

The IRR for the project activity based on the above assumptions is 7.90%.

The benchmark value for the project activity is 14.37% as described in Sub step 3b above. This shows that the IRR for the project activity is not attractive compared to the benchmark. Considering Gold Standard revenues for the project activity, the IRR is working out to 16.83% while estimating the Gold Standard revenues the CER price was considered at Euro 14. Thus it is evident from the IRR analysis that Gold Standard revenues are required for the project to make the project activity attractive.

Sub-step 3d: Sensitivity analysis

The objective of a sensitivity analysis is to determine in which scenarios the project activity would pass the benchmark or become more favourable than the alternative. According to the Guidance on the Assessment of the Investment Analysis issued by EB 41, Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation.

For the proposed project, five parameters were selected as sensitivity analysis factors to check out the financial attractiveness:

- Plant load factor
- Tariff
- Project Cost
- Fuel Cost
- O&M Cost

Assuming the above five factors vary in the range of -10% to 10%, the proposed project IRR (without the income from CERs sales) varies to different extents as shown in Table below.

Table 6 Sensitivity analysis of the proposed project

Factors	-10%	+10%
PLF	2.4	11.50
Tariff	1.41	13.09
Project cost	12.64	1.41

Biomass Fuel Cost	12.64	Nil
O & M Cost	9.87	5.06
Benchmark	14.37%	
With Gold Standard	16.83%	

The above sensitivity analysis indicates that the project is highly sensitive for tariff rate and biomass fuel price and the reality shows that biomass price tend to increase every year. A decrease in biomass prices is therefore very unlikely. The price of biomass includes the transportation cost as well which contributes majorly to the overall cost of it.

<u>Likelihood of IRR reaching Benchmark</u>

PLF increases by: 19.8%

Tariff Increses by: 13%

Project Cost Decreases by: -14%

Fuel Cost Reduces by: -15%

O & M Cost Reduces by: -43%

Hence, the project activity passes step 3 of additionality demonstration.

Outcome of Step 3:
Based on the Investment Analysis above, the proposed project is not financially attractive without consideration of CERs revenues. Combined Scenario 1 "the proposed project not undertaken as a Gold Standard project activity "is not feasible and thus it cannot be baseline scenario.

So, the baseline scenario combination of the proposed project is:
- Combination of P5, B1 and B3: Generation of electricity in the grid; and leaving biomass residues to naturally decay or burning in an uncontrolled manner.

STEP 4: Common practice analysis

Sub-step 4a. Analyse other activities similar to the project activity:

In line with the 'Guidelines on common practice' (ver. 02.0, EB 69, Annex 8), the measure of project activity is categorised as 'Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies'. Further, within the 'different technologies' differentiator 'feedstock', projects based on biomass are considered for analysis here.

Step 1: calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

The project activity has installed capacity of 20 MW. Thus, the applicable range here is 30-10 MW.

Step 2: identify similar projects (both Gold Standard and non- Gold Standard) which fulfil all of the following conditions:
(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(f) The projects started commercial operation before the project design document (Gold Standard - PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Here, the projects in Chhattisgarh State, where the project activity is located are considered. This is because in India, the individual state electricity regulatory commissions decide the tariff. Hence, this changes the investment scenario in each state.

The projects using biomass for fuel and using boiler, TG for the electricity generation are considered ones with similar technology.

The following are list of similar projects from 'Database of Chhattisgarh State Electricity Regulatory Commission'[2]

Sr. No.	plant capacity (MW)	Name of company	CDM status
1	12	M/s Shree Nakoda Ispat Ltd.	Yes[3]
2	15	KVK Bio-Energy Pvt. Ltd.	Yes[4]
3	10	Rukmini Power & Steel Ltd.	Yes[5]
4	12	Mahavir Energy & Coal Benefication Ltd.	Yes[6]
5	14	M/s R.R.Energy Ltd.	Yes[7]
6	12	M/s Arora Infrastructure Development	Yes[8]

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

As can be seen from the Step 2, all projects with applicable capacity range were taken under CDM process. Thus,
$N_{all} = 0$

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

$N_{diff} = 0$

Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

F = 1
As per this guidance, the proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor *F* is greater than 0.2 and *Nall-Ndiff* is greater than 3.

However, in this case, F > 0.2. Therefore, the proposed project is evidently not a common practice in the region.

Based on the analysis above, the baseline scenario is:

[2] http://www.creda.in/sites/default/files/page-document/districtwise%20BMPP.pdf#overlay-context=recrpo
[3] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1258718628.58/view
[4] http://www.dnv.com/focus/climate_change/projects/projectdetails.asp?ProjectId=1203
[5] http://cdm.unfccc.int/Projects/DB/SGS-UKL1153130903.83/view
[6] https://cdm.unfccc.int/Projects/DB/SGS-UKL1269963509.22/view
[7] https://cdm.unfccc.int/Projects/DB/SGS-UKL1158161760.22/view
[8] http://cdm.unfccc.int/Projects/Validation/DB/VPBGU7B5PYJJ5HLLR3G76BR7MNY30G/view.html

- Combination of P5, B1 and B3: Generation of electricity in the grid; and leaving biomass residues to naturally decay or burning in an uncontrolled manner.

B.5. Demonstration of additionality

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The proposed project will process about 1,45,920 tonnes of biomass residue annually. The annual electricity generation is 126.72 GWh. The net electricity used for captive consumption is 114.048 GWh per year. The baseline of the proposed project has been identified in B4. And the "Tool to identify the baseline scenario and demonstrate additionality" is used for the demonstration of additionality of the proposed project above, which shows electricity would be generated by the NEWNE grid which is dominated by coal-fired power plants.

The Gold Standard/carbon revenue consideration and decision process is presented as follows:

Table 3: Gold Standard/carbon revenue **evidence trail**

S.No.	Event	Date	Remark
1	Board Resolution to invest in Project Activity of 20 MW with the support of CDM	29/07/2008	Consideration of CDM support since inception of project activity
2	Purchase Order for boiler	30/07/2008	Start of project activity
3	Appointment of CDM consultant PE Sustainability Solutions Pvt Ltd	29/12/2008	Step towards the CDM registration of the project activity.
4	Stakeholder meeting	05/02/2009	Requirement of CDM
5	First Interview before DNA for HCA	19/03/2009	Step towards the CDM registration status
6	Environmental clearance	25/08/2009	Prerequisite to establish the project.
7	Consent to Establish from CGECB, Raipur	15/01/2010	Prerequisite to establish the project.
8	HCA Approval from DNA	17/03/2010	Consent of DNA in seeking CDM status for the Project
9	Finalisation of DoE	May 2010	Validation Services Agreement with KBS
10	Commissioning of the project activity	01/11/2010	Commissioning certificate
11	First methodology deviation request submitted (M-DEV-0485)	01/04/2013	Copy of methodology deviation request
12	Second methodology deviation request submitted	04/03/2014	Copy of methodology deviation request

Based on the analysis in B.4 and the above description, the CDM was a serious consideration in the decision to proceed with the project and the proposed project is additional.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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Emission Reductions (ER_y)

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y Emissions reductions during year y (tCO_2)
BE_y Baseline emissions in year y (tCO_2e)
PE_y Project emissions during year y (tCO_2)
LE_y Leakage emissions during year y (tCO_2)

Baseline Emissions

As per the ACM 0018, version 03.0, Baseline emissions may, where applicable, include the following emission sources:

- CO_2 emissions from fossil fuel power plants at the project site;
- CO_2 emissions from grid-connected fossil fuel power plants in the electricity system;
- CH_4 emissions from anaerobic decay of biomass residues and/or CH_4 emissions from uncontrolled burning of biomass residues without utilizing them for energy purposes.

Baseline emissions are calculated as follows:

$$BE_y = BE_{EL,y} + BE_{BR,y}$$

Where:

BE_y = Baseline emissions in year y (tCO_2e)
$BE_{EL,y}$ = Baseline emissions due to generation of electricity in year *y* (tCO_2)
$BE_{BR,y}$ = Baseline emissions due to uncontrolled burning or decay of biomass residues in year y (tCO_2e)

Baseline emissions are determined through the following steps:

Step 1: Determination of $BE_{EL,y}$

Baseline emissions from electricity generation are calculated based on the net quantity of electricity generated at the project site under the project scenario ($EG_{PJ,y}$) and a baseline emission factor ($EF_{BL,EL,y}$) which expresses the weighted average CO_2 intensity of electricity generation in the baseline, as follows:

$$BE_{EL,y} = EG_{PJ,y} \cdot EF_{BL,EL,y}$$

Where:
$BE_{EL,y}$ = Baseline emissions due to generation of electricity in year *y* (tCO_2)
$EG_{PJ,y}$ = Net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)
$EF_{BL,EL,y}$ = Emission factor for electricity generation in the baseline in year *y* (tCO_2/MWh)

Step 1.1: Determination of $EG_{PJ,y}$

The net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary ($EG_{PJ,y}$) is determined as the difference between the gross electricity generation at the project site ($EG_{PJ,gross,y}$) and the auxiliary electricity consumption required for the operation of the power plants at the project site ($EG_{PJ,aux,y}$), as follows:

$$EG_{PJ,y} = EG_{PJ,gross,y} - EG_{PJ,aux,y}$$

Where:

$EG_{PJ,y}$ = Net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)

$EG_{PJ,gross,y}$ = Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)

$EG_{PJ,aux,y}$ = Total auxiliary electricity consumption required for the operation of the power plants at the project site (MWh)

$EG_{PJ,aux,y}$ shall include all electricity required on-site for the operation of equipment related to the preparation, processing, storage and transport of biomass residues (e.g. for mechanical treatment of the biomass, conveyor belts, driers, pelletization, shredding, briquetting processes, etc.) and electricity required for the operation of all power plants which are located at the project site and included in the project boundary (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.).

The applied methodology ACM00018, version 02, pg. 18-36 gives detailed steps for calculation of baseline emissions. However, the scenarios discussed therein do not fit to this Gold Standard project activity as it involves common steam header and two waste heat recovery based power plants which are also the registered CDM projects (Reference No. 0264 and 0772) in the project boundary.

As the project activity will be connected to a common steam header along with one coal based AFBC-1 and two waste heat recovery based boilers (WHRB-1 and WHRB-2), it will not be possible to directly measure the contribution of individual boilers to the electricity generation from these three pre-project TGs and project activity TG of 20 MW. Also, the NCV and flow rate of waste heat cannot be monitored, hence, PP proposes to install steam flow and pressure/ temperature meters to monitor individual boiler's enthalpy and apportion energy input to TG/s and also monitor electricity output from the individual TGs. This energy balance of this total (pre-project and project activity) plant will be used to show that electricity output from project activity TG is not higher than the thermal output from the project activity boiler (considering weighted average efficiency of all four TGs).

In line with the approved methodology deviation for this project activity, M-DEV-0485, the conservative emission factor will be combined margin emission factor of the grid.

$EF_{BL,EL,y} = EF_{grid,CM,y}$

Where:

$EF_{BL,EL,y}$ = Emission factor for electricity generation in the baseline in year *y* (tCO_2/MWh)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid-connected electricity generation in year *y* (tCO_2/MWh)

Step 1.3: Determination of $EG_{BL,BR,y}$

As the biomass is not used on site for electricity generation in the base line for the project activity,

$EG_{BL,BR,y} = 0$

Step 1.4: Determination of $EG_{BL,FF,y}$

$$EG_{BL,FF,y} = EG_{PJ,y} - EG_{BL,BR,y}$$

Where:

$EG_{BL,FF,y}$ = Minimum amount of electricity that would be generated with fossil fuels at

		the project site in the baseline in year *y* (MWh)
$EG_{PJ,y}$	=	Electricity generated in power plants included in the project boundary in year *y* (MWh / yr)
$EG_{BL,BR,y}$	=	Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh / yr)

$$EG_{BL,FF,y} = EG_{PJ,y} - 0$$

$$= EG_{PJ,y}$$

Step 1.5: Determination of $EG_{BL,grid,y}$

$EG_{BL,grid,y}$ = 0

Step 1.6: Determination of $EG_{BL,FF/grid,y}$

$$EG_{BL,FF/grid,y} = EG_{PJ,y} - EG_{BL,BR,y} - EG_{BL,FF,y} - EG_{BL,grid,y}$$

Where:

$EG_{BL,FF/grid,y}$	=	Amount of electricity that could be generated in the baseline either by power plants in the electricity grid or by power plants at the project site using fossil fuels in year *y* (MWh)
$EG_{PJ,y}$	=	Electricity generated in power plants included in the project boundary in year *y* (MWh)
$EG_{BL,BR,y}$	=	Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh)
$EG_{BL,FF,y}$	=	Minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh)
$EG_{BL,grid,y}$	=	Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh)

From Step 1.3, 1.4 and 11.5

Hence,

$$EG_{BL,FF/grid,y} = 0$$

Step 1.7: Determination of $EF_{BL,FF,y}$

$EF_{BL,FF,y}$ should be determined using option A or option B below. If fossil fuel power plants were operated at the project site prior to the implementation of the project activity, either option A or option B can be used to determine $EF_{BL,FF,y}$. For new power plants that would be constructed at the project site in the baseline scenario, Option B should be used.

Option A: Determine $EF_{BL,FF,y}$ as per the procedure described under “Scenario B: Electricity consumption from an off-grid captive power plant” in the latest approved version of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”, using data from the three calendar years prior to the implementation of the project activity.

Option B: Determine a default emission factor for $EF_{BL,FF,y}$ based on a default efficiency of the power plant that would be operated at the project site in the baseline and a default CO_2 emission factor for the fossil fuel types that would be used, as follows:

$$EF_{BL,FF,y} = 3.6 \cdot \frac{EF_{BL,CO2,FF}}{\eta_{BL,FF}} \quad (1)$$

Where:

$EF_{BL,FF,y}$	=	CO_2 emission factor for electricity generation with fossil fuels in power plant(s) at the project site in the baseline in year *y* (t CO_2 / MWh)
$EF_{BL,CO2,FF}$	=	CO_2 emission factor of the fossil fuel type that would be used for power generation at the project site in the baseline (t CO_2/GJ)
$\eta_{BL,FF}$	=	Efficiency of the fossil fuel power plant(s) at the project site in the baseline

Step 1.8: Determination of $EF_{grid,CM,y}$

$EF_{grid,CM,y}$ should be determined as the combined margin CO_2 emission factor for grid connected power generation in year *y*, calculated using the latest approved version of the "Tool to calculate the emission factor for an electricity system".

The baseline emission factor is calculated as a Combined Margin, which consists of the weighted average of Operating Margin emission factor and Build Margin emission factor by utilizing the latest data for NEWNE grid, six steps are applied to calculate the baseline emission factor:

Sub-step 1 Identify the relevant electricity systems.
Sub-step 2 Choose whether to include off-grid power plants in the project electricity system (optional).
Sub-step 3 Select a method to determine the operating margin (OM).
Sub-step 4 Calculate the operating margin emission factor according to the selected method.
Sub-step 5 Calculate the build margin emission factor.
Sub-step 6 Calculate the combined margin (CM) emissions factor.

Sub-step 1: Identify the relevant electric power system

Historically, the Indian power system was divided into five independent regional grids, namely northern, Eastern, Western, Southern, and North-Eastern. Each grid covered several states. Since August 2006, however, all regional grids except the Southern Grid have been integrated and are operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids will be treated as a single grid and is being named as NEWWE grid in this document from FY 2007-08 onwards for the purpose of this CO_2 Baseline Database. Due to significant changes in the grid structure, the Indian electricity system is now divided into two grids, the new Integrated Northern, Eastern, Western, and North-Eastern regional grids (NEWNE) and the Southern Grid.

The baseline Emission factor (including Imports) of NEWNE grid published by CEA is considered for calculation of Emission reductions due to displacement of electricity, CEA version 09 was the latest version available during the submission of documents for GS, the same version is considered for computing the emission factor:

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

Since the off-grid power generation is not include in the boundary of the proposed project. The option 1in which only grid power plants are included in the calculation is chosen to calculate the operating margin and build margin emission factor.

Sub-step 3: Select a method to determine the operating margin (OM)

For whether to include off-grid power plants in the project electricity system, there are two options:
Option I: Only grid power plants are included in the calculation.
Optional II: Both grid power plants and off-grid power plants are included in the calculation.

Option I corresponds to the procedure contained in earlier versions of the tool. Option II allows the inclusion of off-grid power generation in the grid emission factor.
No power generation from off-grid was included in the emission factor calculation of NEWNE grid, therefore, here Option I is applicable to the project activity.
The Simple OM is selected and the emission factor is calculated.

Sub-step 4 Calculate the operating margin emission factor according to the selected method.
The approved consolidated methodology ACM 0002 recommends the use of dispatch data analysis as the first methodological choice. However, in India availability of accurate data on grid system dispatch order for each power plant in the system and the amount of power dispatched from all plants in the system during each hour is practically not possible. Also, still the merit order dispatch system has not become applicable and is not likely to be so during the crediting period. In view of this it is proposed to apply other choices as suggested in the ACM 0002. Since the power supplied by low cost must run power plants to the NEWNE grid during 2007-08 is clearly below 50%, it was decided to apply the

Simple OM method.

In the Simple OM method, the emission factor is calculated as 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 data vintage option selected is the *ex-ante* approach, where a 3 year average OM is calculated. The most recent three year CEA data published on the emission factor of NEWNE grid is considered. The CEA baseline is derived using the following formulae to calculate simple OM.

$$EF_{OM,simple,y} = \frac{\sum F_{i,j,y} \times COEF_{i,j}}{\sum GEN_{j,y}}$$

Where:

$EF_{OM,simple,y}$ is emission factor of the Operating Margin by Simple method, in tCO_2/MWh
$F_{i,j,y}$ is the quantity of fuel *i* consumed by plant j in year y in tons of fuel *i*
$COEF_{i,j}$ is the CO_2 emission coefficient of fuel *i* for relevant power plant *j* in the year in tCO_2/tons and
$GEN_{j,y}$ is the generation from power plant *j* in the year in MWh

Calculation must be based on data from an official source (where available) and made publicly available According to methodology discussed in paragraph 12. In the project activity for the calculation of baseline emission, emission coefficient (measured in kg CO_2e/kWh) option (a) selected. Accordingly to methodology combined margin of electricity generation ($kgCO_2/kWh$) of electricity supply system "NEWNE" grid is selected. The values of emission factor of electricity generation are obtained from latest version of CEA, version 9 during submission of documents for validation.

The baseline data have been taken from the Baseline Carbon Dioxide Emission Database with reference to Version 9.0 & User Guide prepared by the Central Electricity Authority (CEA)[9]:

The Combined margin derived figures as shown below

Operating Margin (OM)
The 3-year average Operating Margin for the NEWNE Grid is

Most recent three years	2010-11	2011-12	2012-13
Operating Margin * (OM) in t CO_2/MWh	0.9710	0.9691	0.9914

[9] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Average of 3 years (t CO_2/MWh)	0.9772

* including import

Sub-step 5 Calculate the build margin emission factor.

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

Build Margin (BM) for the year 2012-13	0.9673 t CO_2/MWh

Sub-step 6 Calculate the combined margin (CM) emissions factor.

The combined margin emissions factor is calculated as follows:

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

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

The defaults weights are used, i.e. each of the Operating Margin and Build Margin is weighted equally
i.e. W_{OM}= W_{BM}=0.5
$\mathbf{EF}_{grid\ CM\ y}$ = (0.9772*0.5) + (0.9673*0.5) = 0.9722 t CO_2/MWh

According to the analysis from step 1.3 to step 1.8, the formula (5) will be equal to:

$$EF_{BL,El,y} = EF_{grid,CM,y}$$

Step 2: Determination of baseline emissions due to uncontrolled burning or decay of biomass residues ($BE_{BR,y}$)

$$BE_{BR,y} = BE_{BR,B1/B3,y} + BE_{BR,B2,y}$$

Where:

$BE_{BR,y}$	=	Baseline emissions due to uncontrolled burning or decay of biomass residues in year *y* (tCO_2)
$BE_{BR,B1/B3,y}$	=	Baseline emissions due to aerobic decay or uncontrolled burning of biomass residues in year *y* (tCO_2)
$BE_{BR,B2,y}$	=	Baseline emissions due to anearobic decay of biomass residues in year *y* (tCO_2)

As the baseline scenario for the project activity does not include B2, $BE_{BR,B2,y}$ = 0.

Hence, $BE_{BR,y}$= $BE_{BR,B1/B3,y}$

As per the result of step 2.1

$$BE_{BR,B1/B3,y} = GWP_{CH4} \cdot \sum_{n} BR_{n,B1/B3,y} \cdot 0.001971$$

Hence,

$$BE_{BR,y} = GWP_{CH4} \cdot \sum_{n} BR_{n,B1/B3,y} \cdot 0.001971$$

Step 2.1: Determination of $BE_{BR,B1/B3,y}$

Baseline emissions are calculated by multiplying the quantity of biomass residues with the net calorific value and an appropriate emission factor, as follows:

$$BE_{BR,B1/B3,y} = GWP_{CH4} \cdot \sum_{n} BR_{n,B1/B3,y} \cdot NCV_{n,y} \cdot EF_{BR,n,y} \qquad \textbf{(2)}$$

Where:

$BE_{BR,B1/B3,y}$	=	Baseline emissions due to uncontrolled burning or anaerobic decay of biomass residues in year *y* (tCO_2)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (tCO_2/tCH_4)
$BR_{n,B1/B3,y}$	=	Amount of biomass residues category n used in the project plant(s) included in the project boundary in year *y* for which B1 or B3 has been identified as the most plausible baseline scenario (tonnes on dry-basis)
$NCV_{n,y}$	=	Net calorific value of the biomass residues category n in yeay y (GJ/tonnes on dry-basis)
$EF_{BR,n,y}$	=	CH_4 emission factor for uncontrolled burning of the biomass residues category n during the year *y* (tCH_4/GJ)
N	=	Categories of biomass residues

To determine the CH_4 emission factor, project participants may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use 0.0027 t CH_4 per ton of biomass as default value for the product of NCV_k and $EF_{burning,CH4,k,y}$.[10]

The uncertainty of the CH_4 emission factor ($EF_{BR,n,y}$) is in many cases relatively high. In order to reflect this and for the purpose of providing conservative estimates of emission reductions, a conservativeness factor must be applied to the CH_4 emission factor. The level of the conservativeness factor depends on the uncertainty range of the estimate for the CH_4 emission factor. The appropriate conservativeness factor from Table 7 below shall be chosen and multiplied with the estimate for the CH_4 emission factor. For example, if the default CH_4 emission factor of 0.0027 t CH_4/t biomass is used, the uncertainty can be deemed to be greater than 100%, resulting in a conservativeness factor of 0.73. Thus, in this case an emission factor of 0.001971 t CH_4/t biomass should be used.

Table 7: Conservativeness factors

Estimated uncertainty range (%)	Assigned uncertainty band (%)	Conservativeness factor where lower values are more conservative
Less than or equal to 10	7	0.98
Greater than 10 and less than or equal to 30	20	0.94
Greater than 30 and less than or equal to 50	40	0.89
Greater than 50 and less than or equal to 100	75	0.82
Greater than 100	150	0.73

[10] 2006 IPCC Guidelines, Volume 4, Table 2.5, default value for agricultural residues.

Hence PP chose to adopt defaut value for CH4 emission factor, i.e., 0.001971 tCH_4/t biomass. Hence,

$$BE_{BR,B1/B3,y} = GWP_{CH4} \cdot \sum_{n} BR_{n,B1/B3,y} \cdot 0.001971$$

Hence the Baseline emissions as per the procedure followed in the methodology of ACM0018, are calculated as below.

$$BE_y = BE_{EL,y} + BE_{BR,y}$$

$$BE_{EL,y} = EG_{PJ,y} \cdot EF_{captive,y}$$

$$BE_{BR,y} = GWP_{CH4} \cdot \sum_{n} BR_{n,B1/B3,y} \cdot 0.001971$$

Project emissions

Project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{EL,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y}$$

Where:

PE_y Project emissions during year *y* (tCO_2e)

PE_{FFy} Emissions during the year *y* due to fossil fuel consumption at the project site (tCO_2)

$PE_{EL,y}$ Emissions during the year y due to electricity use off-site for the processing of biomass residues (tCO_2)

$PE_{TR,y}$ Emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2)

$PE_{BR,y}$ = Emissions from the combustion of biomass residues during the year y (tCO_2e)

$PE_{WW,y}$ = Emissions from wastewater generated from the treatment of biomass residues in year y (tCO_2e)

Determination of PE_{FFy}

The following emission sources should be included in determining PE_{FFy}:

- Emissions from on-site fossil fuel consumption for the generation of electric power. This includes all fossil fuels used at the project site in heat generators (e.g. boilers) for the generation of electric power; and
- Emissions from on-site fossil fuel consumption of auxiliary equipment and systems related to the generation of electric power. This includes fossil fuels required for the operation of auxiliary equipment related to the power plants (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.) which are not accounted in the first bullet, and
- Fossil fuels required for the operation of equipment related to the preparation, storage and transportation of fuels (e.g. for mechanical treatment of the biomass, conveyor belts, driers, etc.).
- If any fossilized or non-biodegradable materials are used in the processing of biomass residues and incorporated in the processed biomass residues (e.g. binders) then emissions arising from those materials should be accounted for when the processed biomass residues are combusted. For that purpose those materials should be deemed as fossil fuels. If net calorific values, carbon content and/or emission factors of those materials are available they could be used, otherwise the net calorific values, carbon content and/or emission factors of the most carbon intensive fossil fuel available in the country should be used.

According to the Feasibility Study, the fossil fuel (diesel oil) is used for start-up, and pump operation etc., the emissions from combusting fossil fuels are calculated as "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

$$PE_{FF,y} = \sum FC_{i,j,y} \times COEF_{i,y} \qquad (15)$$

Where:

PE_{FFy} CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2 /yr)
$FC_{i,j,y}$ the quantity of fuel type i combusted in process j during the year y (mass or volume unit / yr)
$COEF_{i,y}$ the CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i the fuel types combusted in process j during the year y

The "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" provides two procedures to determine $COEF_{i,y}$. The Option A requires carbon content and density of the diesel oil used in the Project, however there data are not available at the Project site, therefore the Option B is adopted as follows:

$$COEF_{i,y} = NCV_{i,y} \, X \, EF_{CO2,i,y} \quad (16)$$

Where:

$COEF_{i,y}$ the CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
$NCV_{i,y}$ the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$ the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i the fuel types combusted in process j during the year y

Determination of $PE_{EL,y}$

The project activity does not involve off-site processing of biomass residues. Therefore, the parameter $PE_{EL,y}$ may be excluded from the above equation. Note that the electric power used on-site for the purposes described above are already accounted as part of EG_{PJ},aux,y. $PE_{EL,y.}$ =0

Determination of $PE_{TR,y}$

In cases where the biomass residues are not generated directly at the project site, project participants shall determine CO_2 emissions resulting from transportation of the biomass residues to the project plant. In many cases transportation is undertaken by vehicles. Because the biomass residues are transported from four collection sites around the Project site by trucks, CO_2 emissions from vehicles should be determined using the latest version of the tool "Project and leakage emissions from road transportation of freight".

The emissions due to the transportation of the biomass are included. For ex-ante purpose, these emissions are considered as nil. However, the parameters required to calculate the transportation emissions will be monitored ex-post and then accordingly the emissions will be calculated during the crediting period. These emissions will be calculated using the formula below:

$$LE_{TR,y} = D_{f,my} * FR_{f,m} * EF_{km,CO2} \times 10^{-6} \ldots\ldots\ldots (8)$$

Where:

$LE_{TR,y}$ Leakage emissions from road transportation of freight monitoring period *m* (t CO_2)
$D_{f,my}$ Return trip road distance between the origin and destination of freight transportation activity *f* in monitoring period *m* (km)
$FR_{f,m}$ Total mass of freight transported in freight transportation activity *f* in monitoring period *m* (t)
$EF_{km,CO2}$ Default CO_2 emission factor for freight transportation activity *f* (g CO_2 / t km)

Determination of $PE_{BR,y}$

If project proponents chose to include emissions due to uncontrolled burning or decay of biomass residues ($BE_{BR,y}$) in the calculation of baseline emissions, then emissions from the combustion of biomass residues have also to be included in the project scenario. Otherwise, this emission source need not be included. Corresponding emissions are calculated as follows:

$$PE_{BR,y} = GWP_{CH4} \cdot EF_{CH4,BR} \cdot \sum_n BR_{PJ,n,y} \cdot NCV_{n,y}$$

Where:

$PE_{BR,y}$	=	Emissions from the combustion of biomass residues during the year *y* (tCO_2)
GWP_{CH4}	=	Global Warming Potential for methane valid for the relevant commitment period (tCO_2/tCH_4)
$EF_{CH4,BR}$	=	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)
$BR_{PJ,n,y}$	=	Quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y* (tonnes on dry-basis/yr)
$NCV_{n,y}$	=	Net calorific value of the biomass residues category *n* in year *y* (GJ/tonnes on dry-basis)

To determine the CH_4 emission factor, project participants may conduct measurements at the plant site or use IPCC default values, as provided in Table 8 below. The uncertainty of the CH_4 emission factor is in many cases relatively high. In order to reflect this and for the purpose of providing conservative estimates of emission reductions, a conservativeness factor must be applied to the CH_4 emission factor. The level of the conservativeness factor depends on the uncertainty range of the estimate for the CH_4 emission factor. Project participants shall select the appropriate conservativeness factor from Table 9 below and shall multiply the estimate for the CH_4 emission factor with the conservativeness factor.

For example, where the default CH_4 emission factor of 30 kg/TJ from Table 8 is used, the uncertainty is estimated to be 300%, resulting in a conservativeness factor of 1.37. Thus, in this case a CH_4 emission factor of 41.1 kg/TJ should be used.

Table 8: Default CH_4 emission factors for combustion of biomass residues[11]

	Default emission factor (kg CH_4 / TJ)	**Assumed uncertainty**
Wood waste	30	300%
Sulphite lyes (Black Liquor)	3	300%
Other solid biomass residues	30	300%
Liquid biomass residues	3	300%

Table 9: Conservativeness factors

Estimated uncertainty range (%)	**Assigned uncertainty band (%)**	**Conservativeness factor where higher values are more**

[11] Values are based on the 2006 IPCC Guidelines, Volume 2, Chapter 2, Tables 2.2 to 2.6.

		conservative
Less than or equal to 10	7	1.02
Greater than 10 and less than or equal to 30	20	1.06
Greater than 30 and less than or equal to 50	40	1.12
Greater than 50 and less than or equal to 100	75	1.21
Greater than 100	150	1.37

Leakage

The main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion or other sources due to diversion of biomass residues from other uses to the project plant as a result of the project activity. The baseline scenarios for biomass residues for which this potential leakage is relevant are B5, B6, B7 and B8.

However, in the event that during any of the crediting years leakage is applicable, the following formula as prescribed by the methodology will be applied:

$$LE_y = EF_{CO2,LE} \cdot \sum_n BR_{PJ,n,y} \cdot NCV_{n,y}$$

LE_y = Leakage emissions in year y (tCO_2/yr)

$EF_{CO2,LE}$ = CO_2 emission factor of the most carbon intensive fossil fuel used in the country (tCO_2/GJ)

$BR_{PJ,n,y}$ = Quantity of biomass residues of category n used in power plants which are located at the project site and included in the project boundary in year y (tonnes on dry-basis/yr)

$NCV_{n,y}$ = Net calorific value of the biomass residues category n in year y (GJ/ton of dry matter)

n = Categories of biomass residues for which B5:, B6:, B7: or B8: has been identified as the baseline scenario

$BR_{PJ,n,y}$ = 0.

Hence, LE_y = 0

ERy = BEy – PEy – LE_y

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EFcaptive_{, y}$
Unit	tCO_2/MWh
Description	CO_2 emission factor for the electricity displaced in the grid due to the project activity during the year *y* in t CO_2/MWh
Source of data	CEA CO_2 baseline database for the Indian Power Sector, Version 09 (Average of Simple operating margin (3 years) and Build margin)

Value(s) applied	0.9722
Choice of data or Measurement methods and procedures	The CEA is the prime authority for Indian power sector for determining the guidelines and norms. The authority publishes all the data relevant to the Indian power sector. The CO_2 data base for Indian power sector published by CEA is made available publicly and established in accordance with the guidelines of UNFCCC. Hence, the application of data published by CEA is transparent and conservative.
Purpose of data	baseline emission calculations
Additional comment	

Data / Parameter	$EF_{co2, i, y}$ (EFFF,i)
Unit	*tCO$_2$/TJ*
Description	CO_2 emission factor of each fuel type i
Source of data	IPCC default values / India's Initial National Communication to UNFCCC (INC)
Value(s) applied	Coal : 95.8 tCO$_2$/TJ (Source: NC) Diesel : 74.1 tCO$_2$/TJ (Source: IPCC)
Choice of data or Measurement methods and procedures	IPCC 2006 values have been used for diesel since no country specific data is available.
Purpose of data	project emission calculations
Additional comment	-

Data / Parameter	Biomass residues categories and quantities used for the selection of the baseline scenario selection and assessment of additionality
Unit	Type (i.e. bagasse, rice husks, empty fruit bunches, etc.); • Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, etc.); • Fate in the absence of the project activity (Scenarios B); • Use in the project scenario (Scenarios P); • Quantity (tonnes on dry-basis)
Description	Biomass residues categories and quantities used for the selection of the baseline scenario selection and assessment of additionality
Source of data	Biomass Assessment Report
Value(s) applied	145,920 tonnes per annum
Choice of data or Measurement methods and procedures	Value taken from third party Biomass Assessment Report
Purpose of data	project emission calculations
Additional comment	This parameter is related to the procedure for the selection of the baseline scenario selection and assessment of additionality

Data / Parameter	**$EF_{km\ CO2}$**
Unit	tCO_2 / km
Description	Average CO_2 emission factor for the trucks during year y
Source of data	Default CO_2 emission factor for freight transportation activity as per EB 63, Annex 10, page 4
Value(s) applied	For light vehicle 0.000245 For heavy vehicle 0.000129
Choice of data or Measurement methods and procedures	The default value from the guideline "Default CO_2 emission factor for freight transportation activity" EB 63, Annex 10, page 4 have been used in the absence of country specific emission factor.
Purpose of data	This value is used for project emission calculation.
Additional comment	-

B.6.3. Ex ante calculation of emission reductions

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A. Baseline emissions

1. Baseline emissions due to generation of electricity:

Sub step 2: Determination of $BE_{EL,y}$

The specific parameters and calculations are as follows: The parameters and calculations for baseline emission due to electricity generation are as follows:

The anticipated net electricity generation from the project activity during the year *y* is 114.04 Gwh (after considering auxiliary consumption) multiplied with the $EFcaptive_{,y}$. The resultant baseline emissions are estimated and tabulated as below.

$$BE_{EL,y} = EG_{PJ,y} \times EFcaptive_{,y}$$

$$EG_{PJ,y} = EG_{PJ,gross,y} - EG_{PJ,aux,y}$$

According to the Detailed Project Report, the net electricity generation for captive consumption is 114,048 MWh per year, i.e. $EG_{PJ,y}$ = 114,048 MWh.

Where,

$BE_{EL,y}$ = Baseline emissions due to generation of electricity in year y (tCO_2)
$EG_{PJ,y}$ = Net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)
$EG_{PJ,gross,y}$ = Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)
$EG_{PJ,aux,y}$ = Total auxiliary electricity consumption required for the operation of the power p project site (MWh)

$BE_{EL,y}$ = 114,048 x 0.9722
= 110,881 tCO_2

Baseline emissions due to uncontrolled burning or decay of biomass residues under aerobic conditions:

$$BE_{BR,y} = BE_{BR,B1/B3,y} + BE_{BR,B2,y}$$

Where:

$BE_{BR,y}$	=	Baseline emissions due to uncontrolled burning or decay of biomass residues in year *y* (tCO_2)
$BE_{BR,B1/B3,y}$	=	Baseline emissions due to aerobic decay or uncontrolled burning of biomass residues in year *y* (tCO_2)
$BE_{BR,B2,y}$	=	Baseline emissions due to anearobic decay of biomass residues in year *y* (tCO_2)

For conservativeness,

$BE_{BR,B1/B3,y} = 0$

Project Emissions (*PE_y*)

The emissions from the project activity are estimated based on various assumptions, which are project specific. The project emissions from electricity consumption have been considered zero On-site fuel consumption like auxiliary fuel as HSD has been considered. Moreover, all the above would be monitored ex-post also and actual monitored data will be obtained during the crediting period to derive project emissions.

$$PE_y = PE_{FF,y} + PE_{EL,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y}$$

Emissions during the year *y* due to fossil fuel consumption at the project site (tCO_2)

The consumption of HSD for start up as auxiliary fuel has been considered in ex-ante calculation. An amount of 10 tonnes of HSD has been considered for annual consumption. The same have been included in the ($FF_{project\ site,\ i,\ y}$) monitoring, will be estimated and deducted during each year of crediting period.

Emissions during the year y due to electricity use off-site for the processing of biomass residues (tCO_2)

$PE_{EL,y} = 0$

$PE_{TR,y} = 1,605\ tCO_2$

Emissions from the combustion of biomass residues during the year y (tCO_2e)

$$PE_{BR,y} = GWP_{CH4} \cdot EF_{CH4,BR} \cdot \sum_n BR_{PJ,n,y} \cdot NCV_{n,y}$$

Where:

$PE_{BR,y}$	=	Emissions from the combustion of biomass residues during the year *y* (tCO_2)
GWP_{CH4}	=	Global Warming Potential for methane valid for the relevant commitment period (tCO_2/tCH_4)
$EF_{CH4,BR}$	=	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)
$BR_{PJ,n,y}$	=	Quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y* (tonnes on dry-basis/yr)
$NCV_{n,y}$	=	Net calorific value of the biomass residues category *n* in year *y* (GJ/tonnes on dry-basis)

CH_4 emission factor for combustion of biomass residues in the project plant would be determined based on stack gas analysis using calibrated analyzers. In the absence of such data default values would be used.

$PE_{BR,y}$ = 1,737 tCO_2e

Emissions from wastewater generated from the treatment of biomass residues in year y (tCO_2e)
$PE_{WW,y}$ =0

Total project emissions

$$PE_y = PE_{FF,y} + PE_{EL,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y}$$

PEy = 29.9 + 0 + 1,605 + 1,737

PEy = 3,372 tCO_2e

Leakage
As the baseline emission scenarios for biomass residues of the project activity is B1 or B3, hence the leakage is not applicable.

LE_y = 0

Emission Reduction (ER_y) tCO2e

The net emission reductions from project activity are derived as difference between ‘emission reductions due to the displacement of electricity’ (baseline emissions), project emissions and leakage as shown in the below table.

$$ER_y = BE_y - PE_y - LE_y$$

ER_y = 110,881 - 3,372 – 0

ER_y = 107,509 tCO_2

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)
1	1,10,881	3,372	0	1,07,509
2	1,10,881	3,372	0	1,07,509
3	1,10,881	3,372	0	1,07,509
4	1,10,881	3,372	0	1,07,509
5	1,10,881	3,372	0	1,07,509
6	1,10,881	3,372	0	1,07,509
7	1,10,881	3,372	0	1,07,509
8	1,10,881	3,372	0	1,07,509
9	1,10,881	3,372	0	1,07,509
10	1,10,881	3,372	0	1,07,509
Total	**1,108,881**	**33,720**	**0**	**1,075,090**
Total number of crediting years	**10**			

Annual average over the crediting period	1,10,881	**3,372**	**0**	1,07,509

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	**$FR_{f,m}$**
Unit	*Tons of dry matter*
Description	Total mass of freight transported in freight transportation activity *f* in monitoring period *m* (t)
Source of data	On-site measurements
Value(s) applied	145,920
Measurement methods and procedures	The trucks carrying fuel (biomass residues and fossil fuel) are weighted by a calibrated weighbridge twice upon entry and exit to calculate net quantity of fuel procured. The data on quantity of fuel purchased would be collected, recorded and archived separately for all types of fuels. Accuracy: ±2%
Monitoring frequency	Continuous with monthly recording
QA/QC procedures	Weigh bridge undergoes maintenance and calibration as per defined industry standards. This data would be cross checked against purchase receipts and inventory data.
Purpose of data	Project emission calculation
Additional comment	-

Data / Parameter	$FF_{project\ site,i,y}$
Unit	*Ltrs per year.*
Description	Quantity of HSD consumed in DG set or for the preparation or on-site transportation or of the biomass residues during the year, y.
Source of data	On-site measurements and fuel issuance log books
Value(s) applied	0 (since the consumption of HSD and resultant emissions would be very low, the value is considered ‘0’ for simplification of emission reduction calculations. However, the parameter would be monitored ex-post and used to determine the emission reductions every year during the crediting period)
Measurement methods and procedures	The total quantity of HSD consumed is measured on regular basis using dip stick/ level gauge or store issues. Hence, the total quantity of HSD procured and quantity of HSD consumed is considered for estimation of project emissions. Accuracy: ±2%
Monitoring frequency	Continuous with monthly recording
QA/QC procedures	The data recorded can be cross checked against the fuel purchase receipts.
Purpose of data	Project emission calculation
Additional comment	-

Data / Parameter	**Df,m**
Unit	km

Description	Return trip road distance between the origin and destination of freight transportation activity *f* in monitoring period *m*
Source of data	On site records maintained at project site
Value(s) applied	Is monitored ex-post
Measurement methods and procedures	Monitoring: Once for each reference trip the data is estimated by PP based on the distance using the truck (Light/heavy) odometers (or recorded in challans provided by the supplier and handed over to the plant people by the truck driver). This isupdated every time the road-distance changes and the type of the truck (Light/ heavy) is also monitored in the log book of weighbridge at the entry gate of company. Data Type: Measured and Archived Archiving Procedure: Paper Responsibility: Purchase manager.
Monitoring frequency	Recording frequency: Up on each truck entry
QA/QC procedures	This can be verified by cross checking the information on distance available from other sources (e.g. web sources)
Purpose of data	For project emission calculation.
Additional comment	Data archived is archived electronically for a period of 2 years beyond the crediting period.

Data / Parameter	$EG_{GEN\ CPP}$
Unit	MWh
Description	Total Electricity generated in year y
Source of data	Plant Records
Value(s) applied	-
Measurement methods and procedures	Calculated from summing up the electricity generated from TG1, TG2, TG3 and TG4 The data is archived in paper for the entire crediting period and two years after.
Monitoring frequency	Monthly calculation
QA/QC procedures	-
Purpose of data	Baseline emission calculation
Additional comment	-

Data / Parameter	$FF_{d,y}$
Unit	*liters*
Description	Quantity of diesel combusted in the DG set of project plant during year *y*
Source of data	On-site measurements
Value(s) applied	0 (assumed value for ex-ante calculation of emission reductions)
Measurement methods and procedures	The total number of operating hours of DG set and the corresponding quantity of diesel consumed for the purpose is recorded in the log book maintained at the DG set room. The operating hours and the quantity of diesel consumption is recorded.
Monitoring frequency	Monthly
QA/QC procedures	The data recorded can be cross checked against the fuel purchase receipts
Purpose of data	Project emission calculation
Additional comment	-

Data / Parameter	NCV_{Diesel}
Unit	TJ/Gg
Description	Net calorific value of diesel
Source of data	Page No. 18 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	43
Measurement methods and procedures	-
Monitoring frequency	Once in a monitoring period
QA/QC procedures	-
Purpose of data	Project emission calculation
Additional comment	-

Data / Parameter	$EF_{CO2,diesel}$
Unit	tCO_2/TJ
Description	Carbon dioxide emission factor of each fossil fuel type *i*
Source of data	India's Initial National Communication to UNFCCC IPCC default values http://www.ipcc-nggip.iges.or.jp/EFDB/find_ef.php
Value(s) applied	Diesel : 74.10
Measurement methods and procedures	National level default value is used
Monitoring frequency	Once in a monitoring period
QA/QC procedures	-
Purpose of data	Project emission calculation
Additional comment	-

Data / Parameter	ρ_i
Unit	kg/Lit
Description	Density of the fossil fuel used for the project site (Diesel)
Source of data	Society of Indian automobile manufacturers (SIAM) http://www.siamindia.com/scripts/Diesel.aspx
Value(s) applied	0.82
Measurement methods and procedures	The SIAM value is considered as it is publicly available and can be referred as authentic source.
Monitoring frequency	Once in a monitoring period
QA/QC procedures	- National level default value is used
Purpose of data	Project emission calculation
Additional comment	-

Data / Parameter	S_{gen}
Unit	Tonnes per day
Description	Total Steam generated from WHRB1, WHRB2, AFBC-1 & AFBC-2 boiler
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	This is sum of steam generation by all the boilers. The individual steam flow of each boiler will be monitored using flow meters
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	S_{cons}
Unit	Tonnes per day
Description	Total Steam Consumed by TG#1, TG#2, TG#3 and TG#4 turbine
Source of data	Plant record
Value(s) applied	
Measurement methods and procedures	Calculated
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	S_{vent}
Unit	Tonnes
Description	Total Steam Vented in the CPP
Source of data	Plant record

Value(s) applied	-
Measurement methods and procedures	Calculated (S_{gen}-S_{cons})
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	S_4
Unit	Tonnes per day
Description	Flow of AFBC-2 Steam to common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Measured (m),Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge would be responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	

Data / Parameter	T_1
Unit	^0C
Description	Avg. Temperature of WHRB1 steam before Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge was responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	P_1
Unit	Kg/cm^2
Description	Avg. pressure of WHRB-1 steam before Common header
Source of data	Plant record
Value(s) applied	-

Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge was responsible for Regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	h_1
Unit	KCal/Kg
Description	Enthalpy of WHR (WHRB1) steam
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Calculated from steam tables/ Mollier Diagram as per corresponding temperature T_1 and pressure P_1
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	S_1
Unit	tonnes per day
Description	Flow of WHRB1 steam to common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In- charge would be responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	H_1
Unit	KCal
Description	Total Heat of WHR (WHRB1)steam
Source of data	Plant record

Value(s) applied	-
Measurement methods and procedures	$(h_1 \times S_1) \times 1{,}000$
Monitoring frequency	Daily
QA/QC procedures	Calculated on a daily basis. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	S_2
Unit	tonnes per day
Description	Flow of FBC Steam to Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In- charge would be responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	T_2
Unit	^0C
Description	Average Temperature of FBC boiler before Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge would be responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	P_2
Unit	Kg/cm^2

Description	Avg. Pressure of FBC steam before Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge would be responsible for Regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	h_2
Unit	KCal/Kg
Description	Enthalpy of FBC steam to common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Calculated from steam tables/ Mollier Diagram as per corresponding temperature T_2 and pressure P_2
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	H_2
Unit	KCal
Description	Total Heat of FBC steam to common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	$(h_2 \times S_2) \times 1,000$
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	S_3

Unit	tonnes per day
Description	Flow of WHRB2 steam to common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	S_{WHRB2}- S_{vent}
Monitoring frequency	Continuously
QA/QC procedures	Manager In- charge would be responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	T_3
Unit	^0C
Description	Avg. Temperature of WHRB2 steam before Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge would be responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	P_3
Unit	Kg/cm^2
Description	Avg. Pressure of WHRB2 steam before Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge would be responsible for Regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	h_3
Unit	KCal/Kg

Description	Enthalpy of WHRB2 steam to common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Calculated from steam tables/ Mollier Diagram as per corresponding temperature T_3 and pressure P_3
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	H_3
Unit	KCal
Description	Total Heat of WHRB2 steam
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	$(h_3 \times S_3) \times 1{,}000$
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	S_{4Eff}
Unit	tonnes per day
Description	Flow of Boiler AFBC-2 Steam to Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	$S_4 - S_{vent}$
Monitoring frequency	Continuously
QA/QC procedures	Manager In- charge was responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	T_4
Unit	^0C
Description	Avg. Temperature of AFBC-2 boiler before Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge would be responsible for regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	P_4
Unit	Kg/cm^2
Description	Avg. Pressure of AFBC-2 steam before Common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Online Measurement
Monitoring frequency	Continuously
QA/QC procedures	Manager In-charge would be responsible for Regular calibration. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	h_4
Unit	KCal/Kg
Description	Enthalpy of AFBC-2 steam to common header
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	Calculated from steam tables/ Mollier Diagram as per corresponding temperature T_4 and pressure P_4
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation

Additional comment	NA

Data / Parameter	H_4
Unit	KCal
Description	Total Heat of AFBC-2 steam
Source of data	Plant record
Value(s) applied	-
Measurement methods and procedures	$(h_4 \times S_4) \times 1000$
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	EG_{GEN}
Unit	MWh
Description	Power Generated by WHRB2 Boiler
Source of data	Calculated
Value(s) applied	-
Measurement methods and procedures	$EG_{GEN} (MWh) = \frac{EG_{GEN\ CPP} * (H_4)}{(H_1 + H_2 + H_3 + H_4)}$
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	$EG_{GEN\ CPP}$
Unit	MWh/day
Description	Total Electricity Generated by the CPP
Source of data	Calculated
Value(s) applied	-
Measurement methods and procedures	$EG_{GEN\ CPP} = EG_{TG1} + EG_{TG2} + EG_{TG3} + EG_{TG4}$
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.

Purpose of data	Baseline Calculation
Additional comment	

Data / Parameter	EG_{AUX}
Unit	MWh
Description	WHRB2 Auxiliary Consumption
Source of data	Calculated
Value(s) applied	-
Measurement methods and procedures	$EG_{AUX} (MWh) = \frac{EG_{AUX\ CPP} * (H_4)}{(H_1 + H_2 + H_3 + H_4)}$
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

Data / Parameter	$EG_{AUX\ CPP}$
Unit	MWh/day
Description	Total Auxiliary consumption of the CPP
Source of data	Calculated
Value(s) applied	-
Measurement methods and procedures	$EG_{Aux\ CPP} = EC_{Aux1} + EC_{Aux2} + EC_{Aux5} + EC_{Aux6}$
Monitoring frequency	Daily
QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	Auxiliary Consumption for power plant per day is $EG_{AUX\ CPP}$ (in MWh) which is sum of EC_{Aux1}, EC_{Aux2}, EC_{Aux5} and EC_{Aux6}

Data / Parameter	EG_Y
Unit	MWh
Description	Net Generation (EG_y) from Waste heat Recovery (WHRB2)
Source of data	Calculated
Value(s) applied	-
Measurement methods and procedures	$EG_y (MWh) = (EG_{GEN} - EG_{AUX})$
Monitoring frequency	Daily

QA/QC procedures	The data is calculated. The data is archived in Electronic/paper form for a period a credit + 2 years.
Purpose of data	Baseline Calculation
Additional comment	NA

B.7.2. Sampling plan

>>

Project activity monitors all data and sampling is not involved.

B.7.3. Other elements of monitoring plan

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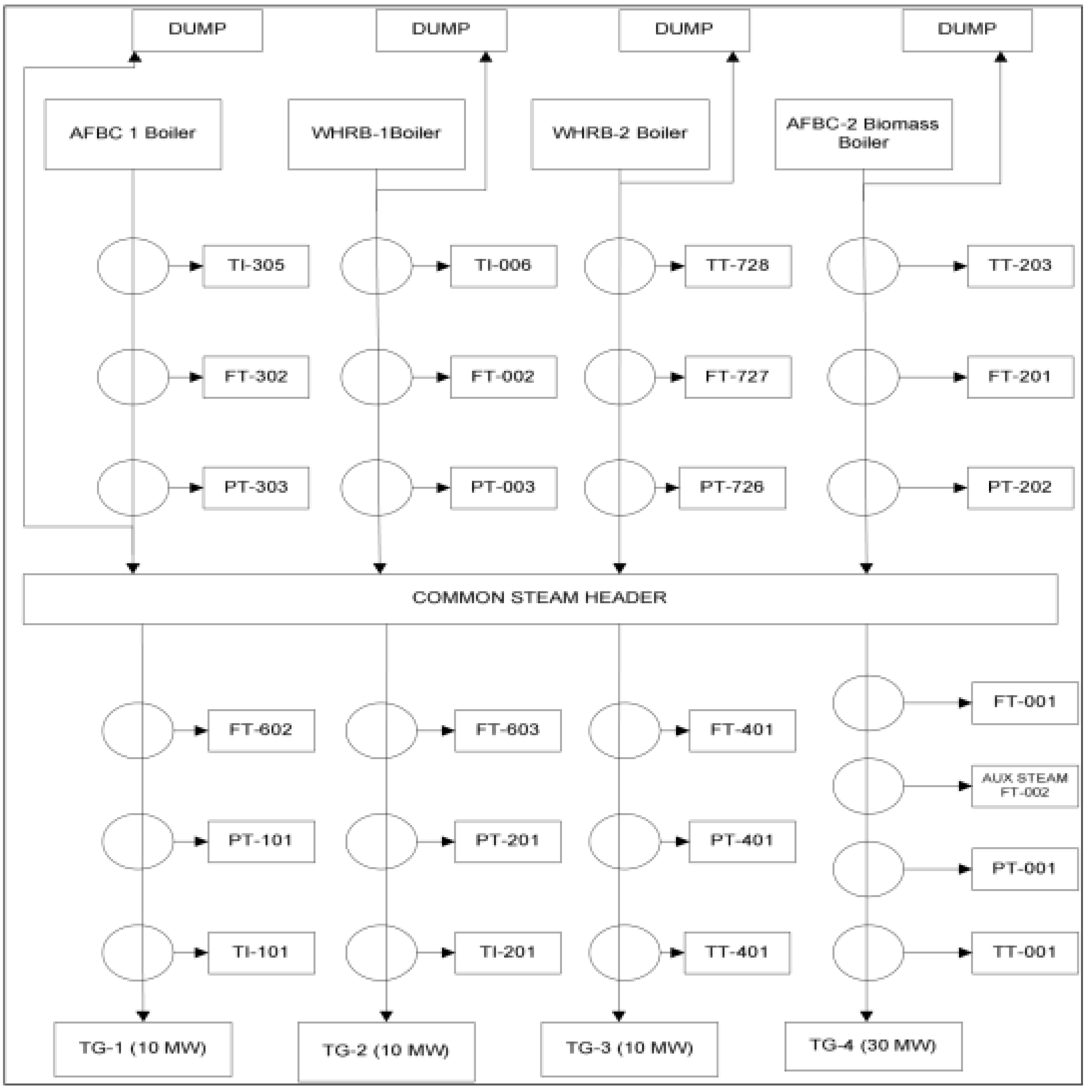
Description of Monitoring Methodology

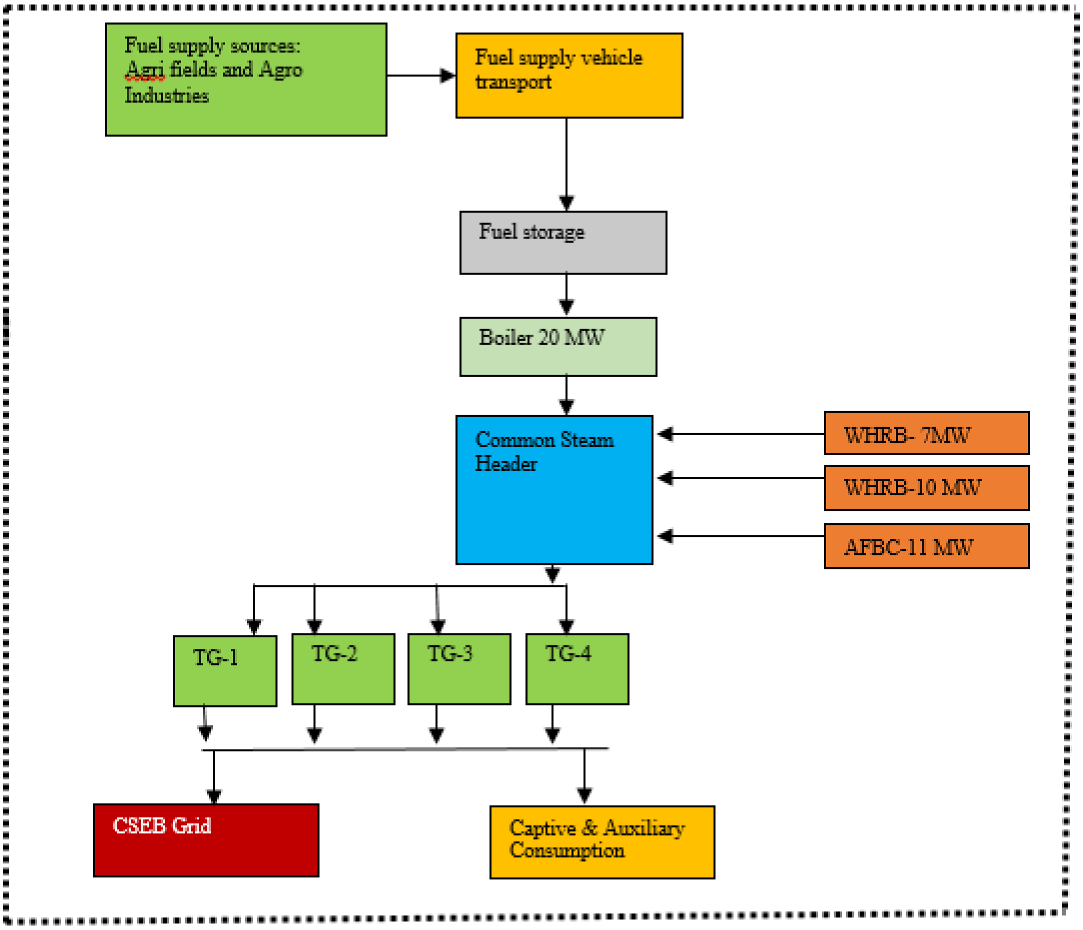
GPIL's Entire Captive Power Plant consists of a 30 TPH Waste Heat Recovery Boiler (WHR), referred as WHRB1, that utilizes waste heat from 350 TPD sponge iron kiln as energy source, a 70 TPH Fluidized Bed Combustion (AFBC-1) Boiler that uses coal rejects (coal char and coal fines) from sponge iron process as fuel, a 54 TPH Waste Heat Recovery Boiler(WHRB2) that utilizes waste heat from another 500 TPD sponge iron kiln as energy source to a common steam header. There are 3 Nos. x 10 MW each and one number 30 MW turbo generator (TG) sets.

WHR (WHRB1) was installed by GPIL as a first CDM Project (Waste Heat based 7 MW Captive Power Project having registration No. 0264) to improve the energy efficiency of the production process and AFBC-1 was installed to avoid the pollution problems associated with disposal of coal rejects as required by pollution control norms. The Project Proponent commissioned another Project Activity with its 500 TPD Sponge Iron Kiln along with WHRB2 Waste Heat Recovery Boiler (having 54 TPH Steam Generation capacity) with one 10 MW Turbine and one 30 MW Turbine to generate 10 MW Power from the fresh facility
i.e. the New Project Activity, which was registered by CDM-EB as "Waste Heat based 10 MW captive power project "GPIL- WHRB 2" CDM PROJECT ACTIVITY (Registration No. 0772).

The project proponent is generating electricity from two locations inside the plant. The power generated from TG1, TG2, TG3 and TG4 are taken to one line and subsequently distributed to the various captive units.

The WHR (WHRB1) was commissioned in September 2002 along with the two numbers of 10 MW each TG sets and AFBC-1 boiler was commissioned later in October 2003. The WHRB2 was commissioned on 1/1/2006 along with one number of 10 MW & one number of 30 MW TG Set. The 100TPH Biomass based AFBC-2 boiler was commissioned and started operation on 1st November 2010.


DUMP
DUMP
DUMP
DUMP
AFBC 1 Boiler
WHRB-1Boiler
WHRB-2 Boiler
AFBC-2 Biomass Boiler
TI-305
TI-006
TT-728
TT-203
FT-302
FT-002
FT-727
FT-201
PT-303
PT-003
PT-726
PT-202
COMMON STEAM HEADER
FT-602
FT-603
FT-401
FT-001
AUX STEAM FT-002
PT-101
PT-201
PT-401
PT-001
TI-101
TI-201
TT-401
TT-001
TG-1 (10 MW)
TG-2 (10 MW)
TG-3 (10 MW)
TG-4 (30 MW)



The methodology requires monitoring the following:

1) The Total electricity generated by TG-1 (EG_{TG1}) is monitored through the independent energy meters(kWh)
2) The Total electricity generated by TG-2 (EG_{TG2}) is monitored through the independent energy meters
3) The Total electricity generated by TG-3 (EG_{TG3}) is monitored through the independent energy meters
4) The Total electricity generated by TG-4 (EG_{TG4}) is monitored through the independent energy meters
5) The Auxiliary electricity consumed in EC_{Aux1}, EC_{Aux2}, EC_{Aux5} and EC_{Aux6} are monitored independently by energy meters

In order to evaluate the contribution of power to captive consumption from the source independently i.e. project activity, the generation from each source are required to be apportioned which is explained below:

Steam calculation

The Steam parameters of pressure and temperature from WHRB1, WHRB2 and AFBC-1 boilers are the same i.e. 35 kg/cm^2 and 410 degree C. As working steam parameters of pressure and temperature are identical for the boilers, the only dependent variable for calculation of waste heat power would be the steam flow from respective boilers. However, to maintain transparency in calculating WHR (WHRB1) power following monitoring methodology is used.

1. **Vent Steam**: To maintain the working pressure (35kg/cm^2) in the common header, some quantity of steam generated is vented (or dumped) out intermittently. Vent position is after the location of flow meters in the steam mains pipes from boilers to the common header. Since the

quantity of vent steam is not measured at the site, thus to arrive at a conservative estimate for project activity purpose it is assumed to be entirely coming from WHRB#2 boiler alone (most conservative estimate). The total vent steam is calculated as the difference of total steam generated from WHRB1, WHRB2 AFBC-1 & AFBC-2 and the total steam consumed in the all the TG sets.

The total vent steam (S_{vent}) is
S_{vent} =
(Total steam generated in WHRB1, WHRB2, AFBC-1 and AFBC-2) – (Total Steam Consumed in TG#1, TG#2, TG#3 & net TG#4)

$=S_{gen} - S_{cons}$

Also, the total vent steam (S_{vent}) quantity in tonnes per day is subtracted from AFBC-2 steam (i.e. S_4) to get the value of Effective AFBC-2 steam (S_{4Eff}) i.e

$S_{4Eff} = S_4 - S_{vent}$

2. **Calculation of Waste Heat Power**: The waste heat power generated is calculated thermodynamically on the basis of Total Enthalpy (steam enthalpy per unit x units of steam flow) of Effective WHR (WHRB1) steam as a percentage of Total Enthalpy of Steam fed to the common header from WHRB1 , WHRB2 and AFBC-1.

The calculation is shown as follows:
Total heat of Steam from WHR (WHRB1) in kCal (H_1)

= (Enthalpy of steam at boiler outlet in kCal/kg) x (WHRB1 effective steam flow in tonnes per day)

$= h_1 * S_1 *1,000$
The enthalpy of steam is calculated based on average temperature and pressure readings for the day and WHR (WHRB1) steam flow.

Similarly Total heat of Steam from AFBC-1 in kCal (H_2)

= Enthalpy of steam at boiler outlet in kCal/kg x steam flow in tonnes per day

$= h_2 * S_2*1,000$

The enthalpy of steam is calculated based on average temperature and pressure readings for the day and steam flow from the AFBC-1 outlet steam flow meter.

Similarly Total Enthalpy of Steam from WHRB2 in kCal (H_3)

= Enthalpy of steam at WHRB2 boiler outlet in kCal/kg x WHRB2 steam flow in tonnes per day

$= h_3 * S_3 *1,000$

Similarly Total Enthalpy of Steam from AFBC-2 in kCal (H_4)

= Enthalpy of steam at AFBC-2 boiler outlet in kCal/kg x AFBC-2 steam flow in tonnes per day

$= h_4 * S_4 *1,000$

If $EG_{GEN\ CPP}$ is the Total Power generated by the all the turbo generators i.e. sum of EG_{TG1} , EG_{TG2} , EG_{TG3} and EG_{TG4} from TG-1, TG-2, TG-3 and TG-4 per day (in MWh) respectively
i.e. $EG_{GEN\ CPP} = EG_{TG1} + EG_{TG2} + EG_{TG3} + EG_{TG4}$

then Power Generated by WHRB 2 Boiler (EG_{GEN}) would be calculated as

$$EG_{GEN}\ (MWh) = \frac{EG_{GEN\ CPP} * (H_4)}{(H_1+H_2+H_3+H_4)} \quad \ldots\ldots 1$$

Again, if Auxiliary Consumption for power plant per day is $EG_{AUX\ CPP}$ (in MWh) then it is sum of EC_{Aux1}, EC_{Aux2}, EC_{Aux5} and EC_{Aux6} from TG-1, TG-2, TG-3 and TG-4 per day (in MWh) respectively

$EG_{Aux\ CPP} = EC_{Aux1} + EC_{Aux2} + EC_{Aux5} + EC_{Aux6}$

Then WHRB2 Auxiliary Consumption (EG_{AUX}) will also be calculated in the same ratio as

$$EG_{AUX}\ (MWh) = \frac{EG_{AUX\ CPP} * (H_4)}{(H_1 + H_2+H_3+H_4)} \quad \ldots\ldots 2$$

Therefore Net Generation (EG_y) from Waste heat Recovery (WHRB2) will be

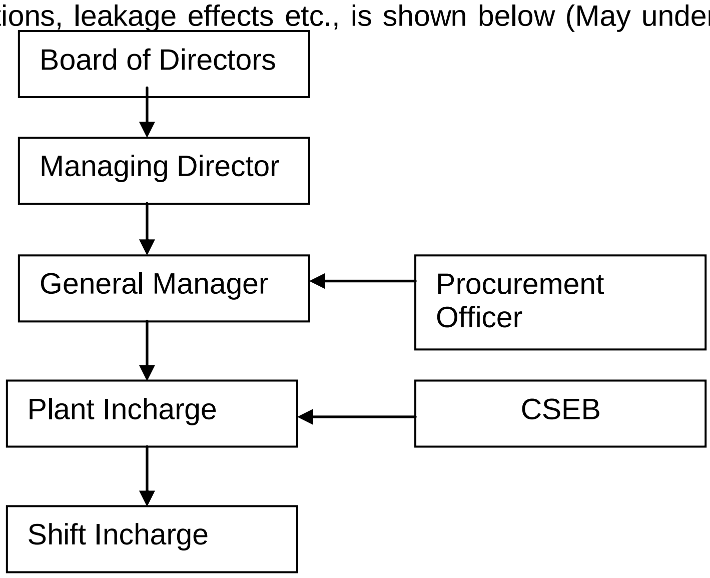
$$EG_y\ (MWh) = (EG_{GEN} - EG_{AUX}) \quad \ldots\ldots 3$$

Considering the fact that the electricity generated by the project activity is used for internal captive consumption.

This monitoring plan is designed for the 20 MW biomass power project implemented by Godavari Power and Ispat Limited, India. This monitoring plan, which would be registered with the CDM - EB as a part of the Project Design Document, describes the operation and management structure, responsibilities and institutional arrangements, parameters and variables, monitoring practices, QA and QC procedures, data storage and archiving etc.

Operational and management structure

The proposed operational and management structure for the project activity for the purpose of monitoring of emission reductions, leakage effects etc., is shown below (May undergo changes if situation demands):



The responsibilities of various personnel in the organization in implementing the monitoring plan are as follows:

S. No	Personnel	Responsibility
1	Procurement Officer	Procurement Officer is responsible to assess the suppliers based on the key parameters and submits recommendation to the General Manager for approval. He is also responsible to procure the fuels permitted by the Local statutory authorities and to meet the plant daily requirement without any shortage. Daily procurement report would be sent to
2	Shift In charge	Shift in charge monitors the plant parameters including the monitoring parameters as described in the PDD. He collects the data recorded in log sheets of respective sections and prepare the consolidated report on electricity generation, export to grid, fuel consumption, plant shut down time, etc. for every shift. These reports would be submitted to the Plant Manager for review.
3	Plant Manager	Review of the monitored parameters for correctness, corrective measures in case of minor errors in the monitored data and preparation of a daily summary on project operation and electricity generation to the General
4	General Manager	General Manager is responsible for the electricity generation of the project. He would cross check and sign the daily plant operation reports regularly, and report to Managing Director for any abnormality. The periodical tests of the monitoring equipments would be looked after by him as per the monitoring plan. The responsibility of storage and archiving of information in good condition also lies with the General Manager. He would also co-ordinate to obtain audit reports as per the monitoring plan from Internal auditors.
5	Managing Director	Managing Director is responsible for the total monitoring plan. The Managing Director examines the reports generated by General Manger w.r.t, the monthly electricity generated; net electricity exported to grid and annual emission reduction calculations as per the monitoring plan. He also examines the internal audit reports prepared by internal auditor/ General manager and in particular takes note of any deviations in data over the norms and monitor that the corrective actions have resulted in adherence to
6	Board of Directors	Review of the quarterly reports submitted by Managing Director, guidance for necessary corrective actions to the concerned person and approval of the quarterly reports to then compile as annual report which would be made available to the DOE for verification.
8	Chhattisgarh State Electricity Board (CSEB) Personnel	Metering the electricity export to grid and electricity import from grid.

Parameters Requiring Monitoring: The following parameters / variables would be monitored under this monitoring protocol.

I. Project Emissions: The following are the various parameters/sub-parameters required to be monitored under project emissions.

Emissions due to combustion of fossil fuels for transportation of biomass

♦ *Total quantity of biomass procured/consumed during the year (tonnes)*

The quantity of biomass fuel procured would be measured, recorded and monitored at the entry of the project premises. As mentioned in the monitoring tables, the truck information such as details of truck, distance of fuel collection site from project and mileage of truck etc, would also be noted. The plant would have a computerized weighing system through which each truck of the fuel would pass through, upon entry and exit. No truck with biomass fuel would be able to enter the plant without measuring the weight of the fuel. The weighing system would be calibrated and sealed regularly as per the regulatory requirement of India.

♦ *Average return trip distance of biomass supply (km)*

The trucks with biomass fuels would be monitored at the weigh bridge system in the project premises. The distance of biomass collection site from the project for each biomass fuel truck would be recorded as part of monitoring. For this, information would be collected based on the interaction with each truck driver carrying biomass fuel. The average return trip distance of biomass would be calculated based on the annual data recorded.

♦ *Net calorific value of biomass during the year (GJ/ton)*

The net calorific value of each type of biomass residues would be monitored under regular time intervals. The samples of each type of biomass residues would be collected from the project site and tested at reputed laboratories, either on the basis of arrival different biomass residues to the project site or once in a quarter year for each type of biomass residues used. The data archived for the year would be considered to calculate the average calorific value of biomass.

♦ *Diesel consumption by DG set during the year (liters)*

The quantity of diesel consumption during the operation of DG set would be recorded in log books maintained at diesel generator room. The log book records comprise the period of operation (hrs) and quantity of diesel consumption (liters), whenever the DG set would be operated.

♦ *Diesel consumption for other purposes(on-site) – such as onsite transportation of biomass and for preparation of biomass (liters)*

The diesel issuance records would be maintained at diesel storage yard/stores. The data records include the quantity of diesel issues, registration no. of vehicle and date of issuance. The consolidated monthly and yearly data would be considered to calculate the project emissions.

Emissions from grid electricity consumption

♦ *Electricity import from the grid system (kWh/MWh)*

The project activity imports electricity during periods of emergency and plant shut down. The import energy meter would be installed at Sub-station to record quantity of electricity consumed by the project activity. The bills raised by CSEB would form evidence for the electricity imports on monthly basis. The monthly records would be consolidated to estimate project emissions.

<u>II. Baseline Emissions:</u> The following are the various parameters/sub parameters required to be monitored under baseline emissions

♦ *Gross electricity generation (kWh/MWh)*

The total power generated by the project activity would be measured in the plant premises to the best accuracy and would be recorded, monitored on a continuous basis through DCS. The gross generation would be recorded on daily basis; the same would be consolidated as monthly and yearly data for the application. All instruments would be calibrated at regular intervals as per the industrial standards of India.

♦ *Electricity Exported to grid (kWh/GWh)*

The project participant would install all necessary Main meter and Check meter facilities in the State Electricity Board Substation, where exported power is connected to the grid. This would be recorded and monitored on a continuous basis. The certified monthly bills by both State Electricity Board and the project participants would form evidence for the data.

<u>III. Leakage:</u> The following are the parameters required to be monitored under leakage.

♦ *Surplus availability of each type of biomass residues*

The project participants would conduct a biomass assessment survey in the project region every year during the crediting period. The biomass assessment report includes total generation of rice husk in the region, total quantity of rice husk consumption the region by various users and surplus available quantity of rice husk. Based on the annual assessment report, leakage effect in the region due to implementation of the project activity would be estimated. If any leakage is found, the leakage emission would be calculated as per the equation provided in section B.6.1.

Monitoring of Fuel quantity:
The quantity and type of fuels is monitored before blending and other processing procedures, and feeding into the boiler. Monitoring is done by the followings:
• Invoice of supplier
• Entry record
• Stock record
• Consumption record

QA AND QC PROCEDURES

The project would employ latest state of art microprocessor based high accuracy monitoring and control equipment that measure, record, report, monitor and control various key parameters like generation by the project, auxiliary consumption and net energy exported to the grid. The monitoring and controls would be the part of the Distributed Control System (DCS) of the entire plant. Necessary standby meters or check meters would be installed to operate in standby mode when the main meters are not working. The Main & Check meters would be calibrated and sealed as per the industry practices at regular intervals/PPA. Hence, high quality is ensured with the above parameters. Sales records would be used and kept for checking consistency of the recorded data.

The baseline emission factor is taken from CEA published data. Hence, quality control of the data is not under the control of project proponent and no QA/QC procedures are applicable.

DATA STOR GE AND ARCHIVING

All of the above parameters monitored under the monitoring plan would be kept for 2 years after the end of the crediting period or the last issuance of CERs for this project activity, whichever is later.
Necessary formats / tables / log sheets etc. would be developed by the project participants for monitoring and recording of the data and would be made part of the registered monitoring protocol (As Annex 4)

B.7.4. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>
10/03/2014,

Please refer to Appendix 1 for contact information.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
30/07/2008, Boiler Purchase order date is the starting date for this project activity.

C.1.2. Expected operational lifetime of project activity

>>
20 years and 0 months

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Fixed crediting period

C.2.2. Start date of crediting period

>>
11/08/2013

C.2.3. Length of crediting period

10 years 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
As required, the project participants has conducted Environmental Impact Assessment (EIA) with the objective to review the environmental status of the plant site and its surrounding areas; the impact of the project on the environment; to plan for environmental management plan meeting the requirements of local pollution control board. The environmental impact assessment for the project activity revealed no negative impacts on the environment.

Management during project construction

The impacts during construction phase on the environment were of transient nature and reduced gradually on completion of the construction activities.

Site preparation: Dust generated during construction activity was suppressed by sprinkling water

Water and air quality: Since no process effluents were discharged, there was no possibility of ground water contamination. To protect air quality due to some arising from transport vehicles, the vehicles were also maintained properly to minimize smoke in the exhaust.

Noise: Noise impact was within acceptable limits on the surrounding population. High noise generating equipment was used only during night time to eliminate any discomfort to the nearby population.

Ecological aspects: As the land chosen for the project is a barren land, no tree cutting was involved nor were there any aquatic bodies in the plant site. Therefore there was no effect on the terrestrial ecology.

Storage of hazardous materials: Hazardous material like diesel, petrol, welding gas etc stored and handled as per guidelines specified under Hazardous Wastes Storage, Handling and Storage Rules of EPA, 1989.

Migrant laborers: Safe and secure camping areas should be provided for the migrant laborers and adequate arrangement are made for supply of water, sanitation and cooking gas.

Management during operation

Air quality management: Major pollutants envisaged from the biomass power plant are particulates, sulphur dioxide, oxides of nitrogen and fugitive dust. The project proponent pursues the following methods of abatement for the control of air pollution.

- Particulate matter is being controlled by providing highly efficient electrostatic precipitator.
- Sulphur dioxide emissions is being controlled by line bed and widely dispersed for providing adequate stack height.
- Green belt is being developed
- Water is sprinkled frequently at all dust generating areas

Stack gas monitoring

The emissions from the stack would be monitored for exit concentration of SOx, NOx and particulate matter.

Water and waste water management:

The water requirement are restricted and conserved by recycling treated water to the maximum extent. Air cooled condenser is used to reduce water consumption in the power plant. Continuous effort is being made to reduce the water consumption and thereby to reduce the waste water generation.

Solid waste management

The main solid waste generated from the biomass power plant is fly ash and bed ash. The fly ash generated is collected in a dry form from ESP and stored in silos. The dry ash is supplied to potential entrepreneurs free of cost for brick manufacturing and cement.

Green belt development

Green belt development is being undertaken all-round the factory. Plantations contribute towards environmental improvement so as to prevent spreading of particulate and other atmospheric pollutants in nearby areas, providing vegetative cover, increasing the aesthetics and ecological aspects of the surrounding

D.2. Environmental impact assessment

>>

Not applicable, since, no negative environmental impacts are anticipated due to the project activity.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

Management of GPIL organized a stakeholders consultation meeting on 05/02/2009 to appraise the stake holders / villagers regarding the project activity.

Requirement of Stakeholder Comments

Before implementing any project, project investors / developers need to identify the stakeholders, prepare necessary documents, approach the identified stakeholders directly and obtain required clearances / approvals. The stakeholders after review of documents and investment profile, would accord approvals / licences or send comments in writing to project investors for further clarifications / corrections. In case they are not satisfied with the project design or they feel that the project affects negatively any of the local environment / social / economical environments, they would not issue clearances / approvals to the project.

To identify local stakeholders, a preliminary visit was made to Godawari Power and Ispat Limited on 21/01/2009 by PE Sustainability Solutions Pvt Limited. Consequent to the discussion with officials of Godawari Power and Ispat Limited, it was decided to organize the stakeholder meeting on 05/02/2009 at GPIL premises at 3:00 PM.

The various stakeholders viz. employees, contractual workers, people from nearby villages, locally elected representative, Government officials were invited to attend the CDM stakeholder consultation meeting. A notice was pasted in the common areas in the plant premise and administrative building to communicate to the employees, contractual workers. A circular was sent to the nearby village panchayats to communicate to the people from nearby villages and locally elected representatives on 27/01/2009.

On the eve of stakeholder consultation meeting , the following activities were undertaken under the chairmanship of Shri. Lakshman Prasad, Advisor, Mining and Environment, GPIL.

The presentation was divided in three parts. First, representative of GPIL made an introduction about the company and their environment and quality policies. Then an introduction of the 20 MW biomass power plant was presented. Advantages of biomass power plant in comparison to the conventional coal based thermal power plant and environmental benefits were also delivered in the presentation. Last, representative of PE International made the presentation about the project activity; this consisted of an introduction to the greenhouse effect, Global Warming, the Kyoto Protocol and the Clean Development Mechanism, CDM requirements, the meaning and objectives of the stakeholder consultation process, a description of the project activity, its expected emission reductions and environmental benefits. Then there was time for questions and information was given about the channels of information available for future comments and questions.

Finally it was requested from the assembled stakeholders for their comments. The stakeholders needed the clarifications related to land requirement of the project and employment opportunities to the nearby villagers as well as the environmental effects of the technology being used for the project activity.
No negative comments were received and all have welcomed the project.

E.2. Summary of comments received

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Stakeholders' Involvement

The local population represented by village panchayat welcomed the project due to various benefits, such as development of infrastructure in the area, increase of income due to the supply of biomass residues and improvement in their standards of living. In the stakeholder's meeting, a query was raised about the availability of biomass and is there any negative impact on current usage of biomass .

Project proponent clarified that this biomass power project, which utilizes only surplus biomass residues available in the region, the project would not cause any negative socio-economic impacts on the local populace and would not result in any scarcity of biomass residues to other users.

Queries was also asked about the possibility of negative environmental impacts. It was clarified that all measures to mitigate environmental impacts have been proposed

Since the project is located near to the electrical substation for power evacuation and the transmission lines are planned along the road, problems of inconvenience to the populace would not arise. Moreover, the project participants have already discussed with various local populaces concerned in the region before applying for clearance.

The stakeholders also needed the following clarifications:

1. land requirement of the project
2. employment opportunities to the nearby villagers

The queries were responded as follows:

There is no land requirement as the project is implemented within the company premises. The project will contribute to sustainable development by utilizing surplus biomass for power generation saving the fossil fuel like coal and reducing environmental impacts of coal combustion such as emission of particulate matter, SO_2, NO_x and generation of flyash which also lead to land degradation.

Regarding the second point, GPIL has committed to MoEF for contribution of 2% of CER towards the various community development activities. All new vacancies/ employment opportunities created on account of the proposed project should be for youth from the local villages. It was clarified that most of the work would require technically skilled manpower. Such manpower if available with appropriate skills in the local villages would be given preference.

The action plan for MoEF contribution to 2% of CER towards sustainable development is as follows :

Proposed areas (tentative)	: 2% of cer revenue/year (%age contribution)
Education for underprivileged children	: 20%
Medical facilities for weaker section of the community	: 20%
Green belt development	: 15%
Infrastructure facilities in Raipur	: 20%
Donations to charitable trust	: 5%
Self employment generation scheme	: 10%
Health camps and awareness programme	: 2.5%
Training and capacity building	: 5%
Supporting sports activities	: 2.5%

E.3. Report on consideration of comments received

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No adverse comments received; hence, no follow up actions are required.

SECTION F. Approval and authorization

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The project activity has received host country approval from NCDMA, India on 17/03/2010.

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Appendix 1. Contact information of project participants and responsible persons/ entities

Organization name	Godawari Power and Ispat Limited
Street/P.O. Box	HIRA Arcade, Pandri
Building	HIRA Arcade
City	Raipur
State/Region	Chhattisgarh
Postcode	492004
Country	India
Telephone	+91 (0)771 4082749
Fax	+91 (0)771 4057601
E-mail	lakshman05@rediffmail.com
Website	www.hiragroupindia.com
Contact person	-
Title	Advisor (Mineral Resources & Environment)
Salutation	Mr.
Last name	Prasad
Middle name	-
First name	Lakshman
Department	-
Mobile	-
Direct fax	+ 91 771 4057601
Direct tel.	+ 91 771 4082749
Personal e-mail	lkp46ster@gmail.com

Appendix 2. Affirmation regarding public funding

The project activity has not received public finding from Annex 1 countries.

Appendix 3. Applicability of methodology and standardized baseline

Please refer Section Section B.2.

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

Please refer Section B.6.2.

Appendix 5. Further background information on monitoring plan

Please refer Section B.7.3.

Appendix 6. Summary of post registration changes

This is not applicable as project activity is not registered.

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Document information

Version	*Date*	*Description*
05.0	25 June 2014	Revisions 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;* • Editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b
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.

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