4 MW BIOMASS BASED COGENERATION PLANT BY GODREJ AGROVET LTD.

Document Prepared By Infinite Solutions

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PROJECT DETAILS

1.1 Summary Description of the Project

Godrej Agrovet Limited (GAVL) is a diversified agribusiness company dedicated to improving the productivity of Indian farmers by innovating products and services that sustainably increase crop and livestock yields. GAVL has interests in animal feed, oil palm plantations, agri-inputs and poultry.

GAVL has set up a new Greenfield palm oil production plant at project activity location. The palm oil production plant has a production capacity to process 70 TPH palm fruit. At the time of project planning stage, GAVL had the option to choose from coal based generation plant and renewable biomass based co-generation project to meet the electricity demand of 4 MW for captive consumption.

GAVL considering the GHG emission reduction opportunity, decided to implement renewable biomass based co-generation project which will use in-house generated renewable biomass fibre, shell and empty fruit bunches (EFB) in the palm fruit processing facility. As the biomass is generated from agro processing industry, it is a renewable biomass as per definitions in 'Glossary of CDM Terms Ver 07.0[1].

Co-generation project activity involve installation of 50 TPH Boiler & 4 MW Turbine Generator. The Process involves use of biomass generated by palm oil production unit to generate steam which will then be used to generate electricity by 4 MW Turbine Generator for captive consumption.

Godrej Agrovet has a similar set up adjacent to the planned project which is registered in VCS ID 1315. However, since the project was registered more than 2 years prior to the start date, thus the projects are not a de-bundled component.

Project Location: Seethanagaram village, District –West Godavari, Andhra Pradesh, India

Pre-project scenario: The project is located at a Greenfield palm oil production plant. Thus, no energy generating units or the energy demand (user plant) existed at the project location in pre-project scenario.

The project leads to an annual emission reductions of 97,671 tCO2e/year

1.2 Sectoral Scope and Project Type

As per simplified modalities and procedures for small scale CDM project activities, the project qualifies under the:

Sectoral Scope : 01 - Energy industries (renewable-/non-renewable sources)
Type : I - Renewable Energy Projects
Category : C. Thermal energy production with or without electricity

Project is neither an AFOLU project nor a grouped project.

1.3 Project Proponent

Organization name	Godrej Agrovet Limited

[1] Biomass residue - Non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms which is a by-product, residue or waste stream from agriculture, forestry and related industries

Contact person	Mr. MSMS Kumar
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Address	Ch. Pothepalli, Dwaraka Tirumala Mandal, Andhra Pradesh
Telephone	+91 8829 211128
Email	msms.kumar@godrejagrovet.com

1.4 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the project	Project Consultant
Contact person	Mr. Jimmy Sah
Title	Head - Sustainability
Address	611, Chetak Centre Main, RNT Marg, Indore - 452001, India
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1.5 Project Start Date

The project is under construction. The expected commissioning date is 01/08/2018.

The Project Start date shall be the Actual Commissioning Date of the Project which will be made available during the first verification.

1.6 Project Crediting Period

The project chooses a renewable crediting period of 10 years. After 10 years, the crediting period will be renewed twice considering project life of 25 years.

Crediting period start date : Commissioning Date of the project or the date of registration of the PD whichever is later.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

As the estimated emission is less than 300,000 tco2e/year the project falls under Category "project".

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)

Year 2018	97,671
Year 2019	97,671
Year 2020	97,671
Year 2021	97,671
Year 2022	97,671
Year 2023	97,671
Year 2024	97,671
Year 2025	97,671
Year 2026	97,671
Year 2027	97,671
Year 2028	97,671
Total estimated ERs	976,710
Total number of crediting years	10
Average annual ERs	97,671

1.8 Description of the Project Activity

The project is a cogeneration unit and will commission one 50 TPH biomass based boiler and a 4 MW turbine generator (TG). The generated steam and electricity is used to meet the captive demand of a green-field palm oil production unit.

The detailed specifications of boiler and TG are as below;

Specification of 50 TPH boiler

Sr. No.	Specification	Value	Unit
1	Type – Pulsating grate bi-drum air cooled boiler	-	-
2	Design steam generation capacity at MCR	50	tph
3	Steam pressure at MCR	34.65	Kg/cm² (g)
4	Steam temperature	380±5	°C
5	Make and Model -	Thermax / Powermax – 500/1	-
6	Fuel requirement: Fuel 1: 55% Shredded Empty bunch Fiber Fuel 2: 30% palm fibre Fuel 3: 15% palm shell	9.35 Shredded EFB, 5.1 Palm Fiber, 2.55 Palm Shell	tph
7	Efficiency of boiler	66.8±5	%
8	Feed water temperature to economiser	126	°C

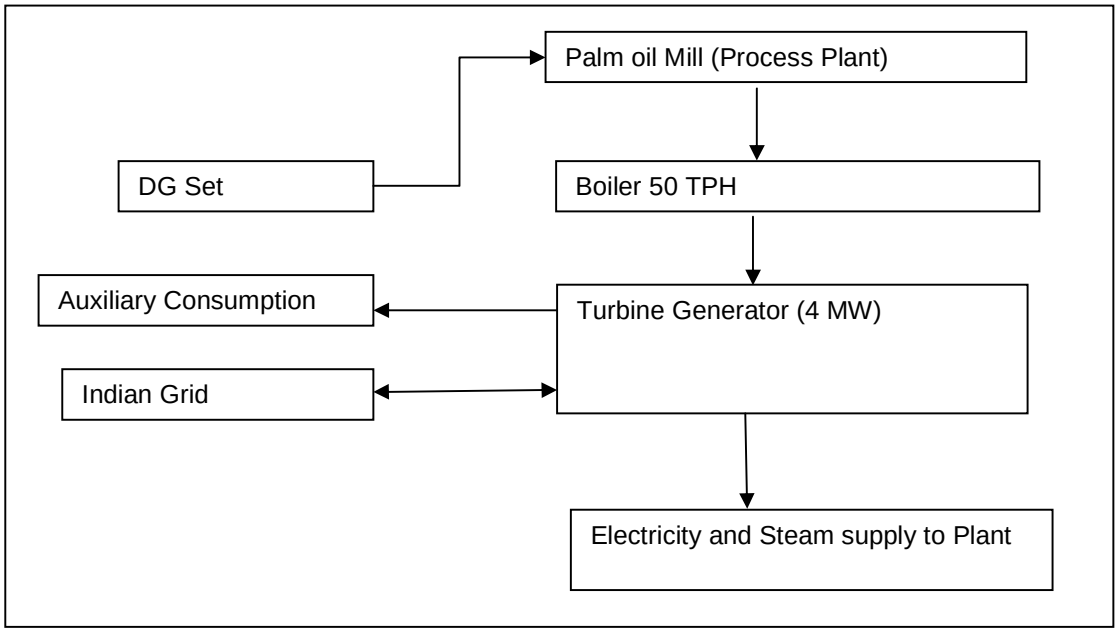
Specification of 4 MW turbine generator

Sr. No.	Specification	Value	Unit

1	Type – multistage, impulse, nozzle governed back pressure	-	-
2	Design capacity	4	MW
3	Inlet steam pressure	33.38	kg/cm^2
4	Inlet steam temperature	370	°C
5	Specific steam consumption	11125	kg/kWh
6	Make and Model – Triveni Turbine Limited	Triveni Turbine Limited / TST-2030	-
7	Outlet steam pressure at TG	3.5	kg/cm^2
8	Electrical output at AC generator terminal (3 phase, 4 wire system, 0.8 PF)	2500 kW (415 V, 50 Hz)	-

The biomass required for the project boiler is generated as by-product of the production plants CPO, PKO.

Line diagram for the project activity



During cold start of the cogen plant, electricity is used from the southern grid of India till TG rolling and synchronization. During the times of grid supply failure, power will be fed from DG set of 1250KVA capacity.

How project will achieve net GHG emission reductions or removals

The project activity utilizes renewable biomass for energy generation and thus displaces the use of coal. Thus, use of this renewable energy reduces equivalent amount of coal burning and in turn achieve GHG emission reduction.

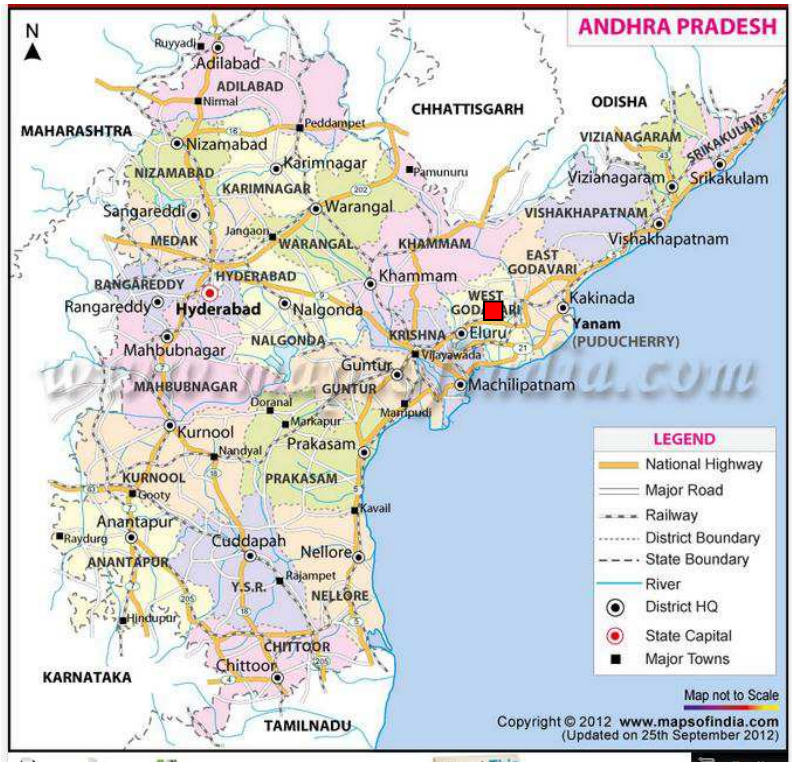
The project technology uses renewable biomass as a fuel which is carbon neutral. The project also employs air pollution control technology of to control the level of the particulate matters. Therefore, the technology can be said as environmentally safe and sound technology.

Lifetime of the project activity
The main project activity equipment's boiler and turbine are expected to have a lifetime of 25 years[2].

1.9 Project Location

Village : Seethanagaram
District : West Godavari
State : Andhra Pradesh
Country : India
Latitude : 17° 10' 38" N
Longitude : 81° 41' 35" E

Plant location from major town/ district headquarter – Eluru – 120 Km



1.10 Conditions Prior to Project Initiation

This project is coming up in a Greenfield industrial plant. Thus, in pre-project scenario, no energy generation sources or the consumer of energy existed in this location.

[2] Default values as per Option C of 'Tool to determine and remaining lifetime of the equipment' Version 01, EB 50, Annex 15

As per the VCS project Description template version 3.3, at the time of project planning GAVL had option to choose a coal based cogeneration plant for meeting the captive energy demand. Hence refer section 2.4.

The project proponents have implemented project for the generation of renewable energy to meet captive demand. Hence, the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity is not mandated by any local or national laws. The project proponent however has obtained the necessary approvals from the applicable statutory bodies. The approvals related to the project activity and the status of its compliance is demonstrated in the Table below:

Sr. No.	Document/ approval from Regulator	Status of compliance and Date of approval
1	Consent to Establish from APPCB	02-Nov-2017
2	Approval from AP Factories Department	27-Oct-17
3	Approval from AP Boiler Department	13-Nov-17
4	Approval from AP Panchayat Raj Department	08-Nov-2017

The project is under construction stage and thus operational approvals are not yet received. The same would be available at a later stage.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The main project activity equipment boiler and turbine were purchased by GAVL. POs of these equipment to the OEM/ suppliers are submitted to the DOE.

1.12.2 Emissions Trading Programs and Other Binding Limits

The project proponent is not part of any emission trading program. GAVL also does not have any binding GHG emission limits. The net GHG emission reductions from the project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions. A letter of this effect from the project proponent has been submitted to the validator.

The project activity has not participated under any other GHG programs. A letter of this effect from the project proponent has been submitted to the validator.

1.12.3 Other Forms of Environmental Credit

The project activity does not result in creation of any other kind of environmental credits. A letter from the project proponent has been submitted to the validator with an undertaking that the project has not created another form of environmental credit. The project is not availing benefits under REC registry. The same can be verified with link provided.
https://www.recregistryindia.nic.in/index.php/general/publics/registered_regens

All other programs under which the project is eligible to participate are other GHG mechanisms. Moreever the project is not registered under any other GHG mechanism. The same can be checked online.

1.12.4 Participation under Other GHG Programs

The project activity has never participated in any other GHG programs nor is registered in any other GHG programs

1.12.5 Projects Rejected by Other GHG Programs

The project activity has never been rejected under any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The project is not part of any grouped projects.

Leakage Management

The project only uses renewable biomass for energy generation and does not cause leakage. The leakage applicable as per SSC methodology will be considered in the calculation of emission reductions in following sections.

Commercially Sensitive Information

The documents shared with DOE during this process do not include any commercially sensitive information.

Sustainable Development

Ministry of Environment & Forests, Government of India has stipulated following indicators for sustainable development in the interim approval guidelines[3] for GHG projects.

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

Social well-being

The main source of fuel for this plant will be locally available agriculture waste i.e. EFB (renewable biomass). Since the project is located in a village it will assist in alleviation of poverty to certain extent by generating both direct and indirect employment in the area of skilled/unskilled jobs for regular operation and maintenance of the power plant.

Economic wellbeing

The biomass-based steam generation is an alternative to fossil fuel based steam generation plants. The project shall create new rural income resulting from the sales of biomass fuel like agriculture waste. Increased income levels shall contribute to the economic safety and empowerment of the most vulnerable sections of local society.

Environmental wellbeing

The project is using biomass for steam generation. There is no net GHG emission from this project activity. Combustion of biomass in the proposed project does not result in net increase in GHG emissions of CO2. Thus, the project causes no negative impact on the surrounding environment contributing to environmental well-being.

Technological well-being

The project makes use of efficient environmentally safe technology for steam generation with no Green House Gas (GHG) emission.

In view of the above, the PP has considered that the project activity profoundly contributes to the sustainable development.

Further Information

Not Applicable

[3] Ministry of Environment and Forest web site: http://envfor.nic.in:80/divisions/ccd/cdm_iac.html

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Type : AMS-I.C
Title : Thermal energy production with or without electricity
Sectoral Scope : 01
Version : 20
EB : 79

Reference: http://cdm.unfccc.int/methodologies/DB/JSEM51TG3UVKADPA25IPUHXJ85HE8A

In line with the applied methodology, following tools and guidelines are referred in this PD:

- Demonstration of additionality of small-scale project activities, Version 12, EB 99 annex 3
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 3.0, EB 96 annex 5
- Tool to calculate the emission factor for an electricity system, Version 6, EB 97 annex 7

2.2 Applicability of Methodology

The project activity is thermal energy production with electricity. The project activity would follow small-scale methodology and I.C project category. The justification for the applicability of the chosen methodology to the project activity is explained in the table below.

Sr. No.	Applicability criteria as per AMS I.C. Ver. 20	Project Status
1	This methodology comprises renewable energy technologies that supply users i.e. residential, industrial or commercial facilities with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.	The project activity comprises of renewable biomass residue based thermal energy generation for captive use. The project activity displaces the energy generation from coal. Thus the applicability condition is met.
2	Biomass-based cogeneration and trigeneration systems are included in this category.	The project activity involves one biomass based boiler and TG in a cogeneration mode. Thus the applicability condition is met.
3	Emission reductions from a biomass cogeneration or trigeneration system can accrue from one of the following activities: a) Electricity supply to a grid; b) Electricity and/or thermal energy production for on-site consumption or for consumption by other facilities; c) Combination of (a) and (b).	Emission reductions from the project activity accrue and are claimed from electricity and steam production for onsite consumption. Thus the applicability condition is met.
4	Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	The project is a new project activity.
5	In the case of new facilities (Greenfield projects) and project activities involving capacity additions the relevant requirements related to determination of baseline scenario provided in the "General guidelines for SSC	This is a greenfield project activity.

	CDM methodologies" for Type-II and Type-III Greenfield/capacity expansion project activities also apply.	
6	The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal (see paragraph 9 for the applicable limits for cogeneration and trigeneration project activities).	The total installed capacity of project equipment is 36.74 MWth. This is less than 45 MW thermal limit of the methodology and will remain same throughout the crediting period. Thus project activity will remain in the limits of small-scale project activity. Please refer calculations below this table for the installed capacity calculation. Thus the applicability condition is met.
7	For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal (see paragraph 9 for the applicable limits for cogeneration project activities)	The boiler of 50 TPH is a multi-fuel fired boiler which is capable of firing biomass as well as coal. However, the project activity primarily intends to use biomass. In case of non-availability of biomass etc; if coal and biomass are co-fired; it will be ensured that the thermal energy generation capacity of the boiler will remain within the small scale limit of 45 MW thermal. As the thermal energy generation capacity calculation is done maximum design steam outlet 50 TPH and 35kg/cm2 pressure, the thermal output will remain at 36.74 MWth and is independent of fuel (biomass/ coal / co-fired).
8	The following capacity limits apply for biomass cogeneration and trigeneration units: a) If the emission reductions of the project activity are on account of thermal and electrical energy production, the total installed thermal and electrical energy generation capacity of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating the capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the installed capacity of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); b) If the emission reductions of the project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment shall not exceed 45 MW	The emissions reductions from the project are on account of thermal and electrical energy. The generation capacity of the project equipment is 36.74 MWth which is less than the limit of 45 MWth.

	thermal; c) If the emission reductions of the project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment shall not exceed 15 MW.	
9	The capacity limits specified in paragraphs 7 to 9 above apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project shall comply with capacity limits specified in the paragraphs 7 to 9, and shall be physically distinct from the existing units.	The project is a new facility and is within the specified limit.
10	If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in the emissions reduction calculation.	The project uses EFB, generated in the plant site.
11	Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	The project participant is the producer of the processed biomass fuel. Thus no separate contract required.
12	If electricity and/or thermal energy produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	The project does not supply energy to any third party.
13	If the project activity recovers and utilizes biogas for producing electricity and/or thermal energy and applies this methodology on a standalone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions as per relevant procedures in the tool “Emissions from solid waste disposal sites” and/or “Project emissions from flaring”. In the event that the biomass fuel (solid/liquid/gas) is sourced from an existing CDM project, then the emissions associated	The project does not recover/utilize biogas.

	with the production of the fuel shall be accounted with that project.	
14	If project equipment contains refrigerants, then the refrigerant used in the project case shall have no ozone depleting potential (ODP).	The project equipment does not contains refrigerants.
15	Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources provided: a) Charcoal is produced in kilns equipped with methane recovery and destruction facility; or b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. These emissions shall be calculated as per the procedures defined in the approved methodology "AMS-III.K: Avoidance of methane release from charcoal production by shifting from traditional open-ended methods to mechanized charcoaling process". Alternatively, conservative emission factor values from peer reviewed literature or from a registered CDM project activity can be used, provided that it can be demonstrated that the parameters from these are comparable e.g. source of biomass, characteristics of biomass such as moisture, carbon content, type of kiln, operating conditions such as ambient temperature.	The project does not used Charcoal.
16	In cases where the project activity utilizes biomass, sourced from dedicated plantations, applicability conditions prescribed in the tool "Project emissions from cultivation of biomass" shall apply.	The project does not source biomass from dedicated plantations.

Installed thermal energy generation capacity of project

Description	**Unit**	**Details**
Quantity of steam generated	TPH	50
Temp of steam	Deg C	380
Pressure of steam	kg/cm2	35
Feed water temperature	Deg C	126
Efficiency of biomass based boiler	%	67%
Working Days in a year	No. of Days	365
Run hrs in a year	hrs	8,760
Enthalpy of steam (@ 35 kg/cm2)	kJ/kg	3,174.65
Enthalpy of feed water (@126 Deg C)	kJ/kg	529.37
Net Energy output of boiler at rated capacity	kJ/kg	2,645.28
Total Thermal Ouput of the boiler	kJ/hr	13,22,64,200
Thermal output from the boiler	MWth	36.74

Compliance with "General Guidelines to SSC CDM methodologies" (Ver. 22.1)

For the biomass based project activities, following paragraphs apply and the compliance of applicable conditions is discussed below:

- **Para 33**: *In the case of project activities and PoAs using biomass, emission reductions may only be accounted for the combustion of "renewable biomass". Project participants and coordinating/managing entities shall refer to the "Definition of Renewable Biomass"*
  Compliance: The applicability conditions of the applied SSC methodology 1, 2, 3 and 10 have covered this requirement.
- **Para 34**: *For leakage in project activities and PoAs using biomass, project participants and coordinating/managing entities shall refer to the "General guidance on leakage in biomass project activities".*
  Compliance: The tool is used for calculation of leakage and discussed further in the following Section 3.
- **Para 35**: *If the project activity recovers and utilizes biogas for power/heat production and applies a Type I methodology on a stand-alone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficient flaring), shall be taken into account either as project or leakage emissions.*
  Compliance: Para 35 is not applicable as project activity does not involve biogas.
- **Para 36**: *Biomass agricultural residues (wood, wood product, straw) used in case of project activities and PoAs for energy purposes, shall not be stored longer than one year before they are used.*
  Compliance: The biomass generated from the project shall not be stored longer than one year.

All the applicability conditions relevant to the project activity are met and it is used further.

2.3 Project Boundary

As per AMS I.C, the spatial extent of the project boundary encompasses:

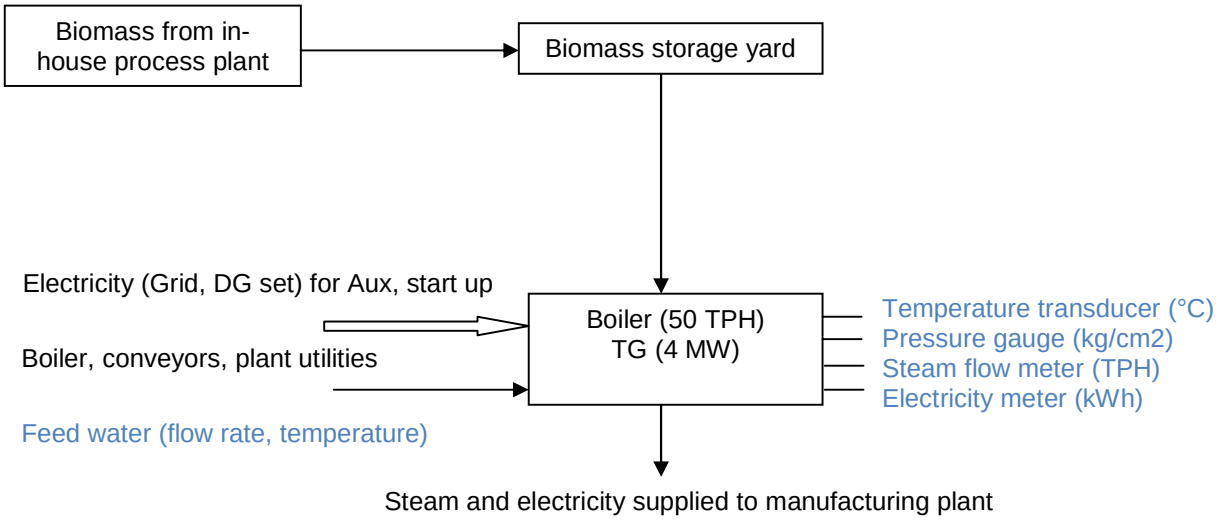
a) All plants generating electricity and/or thermal energy located at the project site, whether fired with biomass, fossil fuels or a combination of both;
b) All power plants connected physically to the electricity system (grid) that the project plant is connected to;
c) Industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment affected by the project activity;
d) The processing plant of biomass residues, for project activities using solid biomass fuel (e.g. briquette), unless all associated emissions are accounted for as leakage emissions or are part of an independently registered CDM project;
e) The transportation itineraries, if the biomass is transported over distances greater than 200 kilometres, unless all associated emissions are accounted for as leakage emissions;
f) The site of the anaerobic digester in the case of project activity that recovers and utilizes biogas for producing electricity and/or thermal energy and applies this methodology on a standalone basis, i.e. without using a Type III component of a SSC methodology.

The project boundary of this project activity includes (a), (b) and (c) as per above given components. These include (a) project boiler and turbine generator, one back up DG set (b) Indian grid (c) palm oil production plant of PP.

Component (d) is not applicable as all associated emissions are accounted for as leakage. As biomass is used from the same industrial facility where project activity is located, transportation is within 200 km and component (e) is not applicable. The project activity does not involve anaerobic digester and hence component (f) is also not applicable.

Source		Gas	Included?	Justification/Explanation
Baseline	Coal based cogeneration plant	CO_2	Yes	Important emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
		Other	No	Excluded for simplification. This is conservative.
Project	Biomass based cogeneration plant	CO_2	Yes	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	This emission source is assumed to be very small.
		N_2O	No	This emission source is assumed to be very small.
		Other	No	This emission source is assumed to be very small.

Schematic of the project boundary



2.4 Baseline Scenario

'Approved methodology AMS I.C. Version 20 has been applied to the project activity as it meets applicability criteria outlined in the methodology. Following paragraphs demonstrate selection of baseline scenario out of the various alternatives available to the project proponent.

Identification of alternative baseline scenarios:
The methodology as applied to the project activity involves the identification of alternative baseline scenarios that provide or produce electricity/ steam for in-house consumption. As per the approved methodology AMS I.C. version 20, para 28, the baseline scenario applicable to the project activity is as follows:

Project activities producing both electricity and thermal energy shall use one of the following baseline scenarios:

Baseline Alternatives as per AMS I.C.	**Discussion of alternative based on its realistic application**	**Remark**
a) Electricity is imported from a grid and thermal energy is produced using fossil fuel;	NA	NA
b) Electricity is produced in an on-site captive power plant using fossil fuel (with a possibility of export to the grid) and thermal energy is produced using fossil fuel;	NA	NA
c) A combination of (a) and (b);	NA	NA
d) Electricity and thermal energy are produced in a cogeneration or trigeneration unit using fossil fuel (with a possibility of export of electricity to a grid/other facilities and/or thermal energy to other facilities);	Applicable to project activity.	Chosen baseline scenario
e) Electricity is imported from a grid and/or produced in an on-site captive power plant using fossil fuels (with a possibility of export to the grid); thermal energy is produced using biomass;	NA	NA
f) Electricity is produced in an on-site captive power plant using biomass (with a possibility of export to a grid) and/or imported from a grid; thermal energy is produced using fossil fuel;	NA	NA
g) Electricity and thermal energy are produced in a biomass fired cogeneration or trigeneration unit (without a possibility of export of electricity either to a grid or to other facilities and without a possibility of export of thermal energy to other facilities);	NA	NA
h) Electricity and/or thermal energy produced in a co-fired system;	NA	NA
i) Electricity is imported from a grid and/or produced in a biomass fired cogeneration or trigeneration unit (without a possibility of export of electricity either to the grid or to other facilities); thermal energy is produced in a biomass fired cogeneration or trigeneration unit and/or a biomass fired boiler (without a possibility of export of thermal energy to other facilities);	NA	NA
j) Electricity is imported from a grid and/or		

produced in an on-site captive power plant using fossil fuel and thermal energy is produced using electricity.		

Considering the case of the project, it is a stand-alone palm oil mill and requires electricity and steam for its operation. Thus, the options considered for further analysis are

Alternative (d): *Electricity and thermal energy are produced in a cogeneration or trigeneration unit using fossil fuel (with a possibility of export of electricity to a grid/other facilities and/or thermal energy to other facilities);*

Alternative (g): *Electricity and thermal energy are produced in a biomass fired cogeneration or trigeneration unit (without a possibility of export of electricity either to a grid or to other facilities and without a possibility of export of thermal energy to other facilities);*

The best option for the PP would be to adopt a cogeneration plant to fulfil the electricity and steam requirements utilizing the biomass generate from the palm oil mill. Further, as there is no consumer of electricity and thermal energy in the vicinity of the project activity, options involving export of electricity or thermal energy are also not realistic.

Hence, the baseline scenario is Alternative (d) where electricity and steam is produced in a cogeneration unit using coal.

Finally, GAVL had following options for the energy generation to meet captive demand:

1. Project Activity – Biomass based co-gen plant
2. Baseline - Coal based co-gen plant

2.5 Additionality

As the project activity is a small scale project therefore Tool to Demonstration of additionality of small-scale project activities, Version 12, EB 99 annex 3 is referred here for evaluate additionality of the project activity

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind
Outcome of Step 0:
The proposed project activity is not the first-of-its-kind. Hence not applicable.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity
Outcome of Step 1a:
As seen on Section 2.4; this project is coming up in a Greenfield industrial plant, at the time of project planning, GAVL had following options for the energy generation to meet captive demand:

1. Biomass based cogeneration plant without VCS revenue
2. Coal based cogeneration plant

Sub-step 1b: Consistency with mandatory laws and regulations

National and sectoral policies and circumstances:
As per EB-22, Annex-3, para-6(a) and para-6(b), there are two types of national and/or sectoral policies that are to be taken into account when establishing baseline scenarios. There were no such national and/or sectoral policies or regulations either under paragraph 6 (a) that have been implemented before adoption of the Kyoto Protocol by the COP (decision 1/CP.3, 11 December 1997 or under paragraph 6 (b)

that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) that gives comparative advantages to more emissions intensive technologies or fuels over less emissions-intensive technologies or fuels or vice-versa.

There is no regulation that stipulates fuel for co-generation in industries including distilleries. Thus, industries use coal, lignite, biomass (bagasse, rice husk etc.) depending on availability. A list of industries using coal from Western Coalfields Limited, a Government managed coal mine owner company in the region of the project activity has been made available to the DOE. Thus, coal is abundantly available in the region and even non-core (other than power, cement, sponge iron, steel etc.) industries use coal for captive steam and power demand.

Due to low utilization of biomass, nationally there are various promotion schemes for biomass use especially for electricity generation (including cogeneration).

Biomass promotional policy of Government:
Ministry of New and Renewable Energy, Govt. of India has notified a Scheme on Biomass Energy and Co-Generation (non-bagasse) in Industry with the following objectives:

1. To encourage the deployment of biomass energy systems in industry for meeting thermal and electrical energy requirements.
2. To promote decentralized / distributed power generation through supply of surplus power to the grid.
3. To conserve the use of fossil fuels for captive requirements in industry.
4. To bring about reduction in greenhouse gas emissions in industry
5. To create awareness about the potential and benefits of alternative modes of energy generation in industry.

The scheme has a provision for providing Central Financial Assistance for encouraging setting up Biomass Gasifiers and Biomass Co-generation (non-bagasse) projects in the industries for meeting their thermal and electricity requirements. This includes Central Financial Assistance in terms of capital subsidy.

Outcome of Step 1b:
This project has not received any capital subsidy/ special tax breaks and the investment analysis presented in following sections considers all applicable national and state level policies.

Step 2: Investment Analysis

Sub-step 2a: Determine appropriate analysis method

As per “Tool for the demonstration and assessment of additionality” (version 07.0.0), for financial analysis of the project, the following three options are available:

Option I: Simple Cost Analysis
Option II: Investment Comparison Analysis
Option III: Benchmark Analysis

As per the tool, PP has to determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis.

Option I: Simple cost analysis is applied only in cases where there is no revenue generation apart from VCS benefits. This is not the case in the project activity as savings result from displace coal cost and electricity HT tariff) and hence, this analysis is not appropriate.

Option III: As per guidance 19 of Annex 5 of EB 62, benchmark analysis is applied where baseline does not require any investment. Since the alternatives identified here require investment to be made, this is not suitable analysis.

Option II: As per guidance 19 of Annex 5 of EB 62, an investment comparison analysis is applied where the baseline leaves the project participant no other choice than to make an investment for electricity generation to meet captive demand.

Since GAVL had no other choice than to choose from alternatives identified which require investment to be made, hence Option II: Investment Comparison Analysis is used as an appropriate financial analysis method.

Outcome of step 2a:
The investment comparison analysis is chosen.

Sub-step 2b: Option II. Apply investment comparison analysis

Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g. levelized cost of electricity production in INR/kWh or levelized cost of delivered heat in INR/GJ) most suitable for the project type and decision-making context.

As the electricity is consumed for captive demand in the plant, there is no sale of electricity so there is no financial revenue streams from the investment options. Financial indicator such as IRR, NPV, cost benefit ratio take the financial revenue streams into consideration therefore these financial indicators cannot be used for carrying out investment comparison analysis.

Whereas, LCOE determines the cost of energy produced, levelised cost of energy is an economic metric that enables to compare different competing energy technologies such as gas, coal, nuclear, solar, hydro, and wind. It can also be applied to compare and contrast different investment scenarios.

LCOE calculation approach, LCOE is the cost to generate a defined amount of energy, hence the NPV of lifetime generation costs is divided by the NPV of the lifetime generated energy

Hence, PP as chosen levelized cost of electricity production in Rs./kWh or levelized cost of delivered heat in Rs./GJ) as it is the most suitable financial indicator to carry out investment comparison analysis.

Outcome of step 2b:
Levelized cost of delivered heat in Rs./GJ) is used as a financial indicator which is an appropriate indicator for the project type and in the context of investment decision

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):

The calculation and comparison of the unit cost of energy generation for both the alternatives identified above.

The unit cost of generation for each alternative has been calculated as below:
= Total annual cost (expenditure) of energy generation (INR) / total energy generated in year (GJ)

Data inputs/ assumptions:

1) **Biomass based cogeneration plant**

   1.1 Total project cost

Sr. No.	Equipment/ Service	Price (Mn. Rs.)	Reference
1	Boiler	136	As per DPR
2	Balance of boiler plant	96.8	
3	E&C (boiler, BOP, Fuel ,Ash, WTP)	50.905	
4	TG set	71	
5	TG E&C	11.5	
6	Fuel, material, ash handling system	17.25	
7	Water treatment system - RO, DM plant	16	
8	Boiler	136	
	TOTAL PROJECT COST	**399.455**	

1.2 Plant specifications and fuel characteristics

Sr. No.	Equipment/ Service	Price (Mn. Rs.)	Reference
1	Boiler rated capacity	50 TPH at 35 kg/cm2	As per DPR
2	TG rated capacity	4 MW	As per DPR
3	Plant operation days	365 / year	Based on the production plant operations estimated
4	Plant load factor	80%	APERC tariff order 06/08/2013, pg. 2 http://www.aperc.gov.in/OtherOrders/2013/Ord_consequentialeffecttoorder&APTELorder.pdf
5	Inlet feed water	126°C	As per DPR
6	Efficiency of Boiler	67%	As per DPR
7	Fuel GCV Palm fibre - Palm shell - EFB -	in kcal/kg 3,450 4,320 2,540	Laboratory analysis of samples
8	Fuel Cost	3.59 INR/Kg	http://biomasspower.gov.in/document/programme-regulatory/Andhra/2%20APERC%20-%20Variable%20cost%202014-15%20to%202018-19.pdf
9	Auxiliary electricity consumption of cogen plant	10%	http://biomasspower.gov.in/document/programme-regulatory/Andhra/2%20APERC%20-%20Variable%20cost%202014-15%20to%202018-19.pdf
10	Depreciation on plant and machinery	5.28%	As per CERC order page 49 http://www.cercind.gov.in/2018/orders/2.pdf
11	Annual O&M cost	4%	@ 4% of capital cost as per APERC tariff order 2004, pg. 36

Based on the excel worksheet financial model, the levelized cost of biomass based co-generation plant is 619.61 Rs./GJ.

2) Coal based cogeneration plant

2.1 Total project cost

For conservative analysis, the project cost of coal based co-generation plant is taken same as that of biomass based plant. The boiler used in the project activity is multifuel boiler and is capable of using coal as fuel. Also, only coal fired boiler are generally cheaper than biomass / multifuel boiler as later one require conveyor system, travelling / pulsating grate, larger furnace area etc. Thus, this assumption is realistic and conservative.

2.2 Plant specifications and fuel characteristics

For conservative analysis, the plant specification of coal based cogeneration plant is taken same as that of biomass based plant. Only the coal calorific value and landed price are specific.

1	NCV of coal	3800 kcal/kg	Calculated from Price Notification of The Singareni Collieries Company Ltd. Hyderabad dt. 08-Feb-2018, Coal considered is G11 grade based on calorific value and price optimization https://scclmines.com/uploads/coalPrice/3.PDF
2	Landed cost coal	3156 Rs./ton	Calculated from price notification referred above and public reference on railway tariff based on distance between mine and project plant

Based on the excel worksheet financial model, the levelized cost of coal based co-generation plant is 469.19 Rs./GJ.

S. No.	Scenario	Unit cost of process (Rs./GJ)
1	Baseline - Coal based cogen plant	469.19
2	Project Activity – biomass based cogen plant	619.61

Outcome of step 2c:
Thus it can be concluded that the baseline for the project activity based on Levelised cost of energy generation is coal based cogen plant.

Sub-step 2d: Sensitivity analysis (only applicable to Options II and III)

As per guidance 20 of Annex 5 of EB 62, according to the investment analysis guidance, 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 in a range of +10% to -10% (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), the following parameters are subjected for the sensitivity analysis:

Probability to breach the benchmark:
Sensitivity Parameter 1 : PLF
The PLF is taken as per APERC Tariff Order and can change depending on change in operating days and planned/ unplanned shutdown, maintenance requirement etc. Thus parameter is subjected to a default sensitivity range +10% to -10% as per guidance. Moreover PLF is same under both investment options considered for investment comparison analysis and hence variation in PLF will not have impact on decision
Sensitivity Parameter 2 : Fuel cost
Fuel cost is volatile parameter and it is subject to escalation over the life of project. Thus, this parameter

is considered under the sensitivity analysis and is subject to default sensitivity range +10% to -10%.

The investment comparison results shows that Levelised cost in case of bagasse is higher compared to baseline fuel coal even at the higher escalation in Coal Price. However Fuel Cost of Coal has to increase by 34.68% for Levelised cost of coal to rise above biomass , which is highly unlikely scenario

Sensitivity Parameter 3 : Net calorific value

Net calorific value depends on the different types of fuel for each and every batch. It will not remain constant for every time. As the NCV of biomass residues used in the project activity has been taken from the lab test report and calculated on dry basis, there is not much variation envisaged in the NCV. Still PP has given the provision of +10% to -10% of sensitivity.

Sensitivity Parameter 4 : O&M cost

As O&M cost is taken from APERC order in absence of actual operations, it is subjected to a default sensitivity range +10% to -10% as per guidance. However, reduction in the O&M cost is highly unlikely.

Moreover O&M cost is same under both investment options considered for investment comparison analysis and hence variation in O&M cost will not have impact on decision

Sensitivity Parameter 5 : Project cost

As the project cost as per DPR is same as per actual cost, so no variation is expected. However, sensitivity analysis over default ±10% is conducted on this parameter.

Moreover Project cost is same under both investment options considered for investment comparison analysis and hence variation in Poject cost will not have impact on decision

Unit cost of energy generation using VCS project (Rs./GJ)

	PLF		**Fuel Cost**		**NCV**		**O&M Cost**		**Project Cost**	
	-10%	**+10%**	**-10%**	**+10%**	**-10%**	**+10%**	**-10%**	**+10%**	**-10%**	**+10%**
Biomass cogen plant	623.44	616.48	561.09	678.13	684.63	566.41	617.18	622.04	623.44	616.48
Coal plant	473.12	465.97	425.81	512.57	517.39	429.75	466.67	471.71	473.12	465.97

Outcome of Step 2d:
From the sensitivity analysis, it is clear that Levelised cost of energy generation for Biomass based plant is higher than the coal based plant. Thus, project activity is not economically most attractive alternative and is additional.

Outcome of Step 2:
The proposed project activity is unlikely to be the most financially/economically attractive.

2.6 Methodology Deviations

The project does not use any methodology deviation.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

As per para 38 of AMS I.C. "*For electricity and thermal energy produced in a baseline cogeneration or trigeneration unit, using fossil fuel (case 28(d)), the following equation shall be used to determine baseline emissions*":

$$BE_{cogen/trigen,CO2,y} = \left[\left(\frac{EG_{PJ,thermal,y} + EG_{PJ,electrical,y} \times 3.6}{\eta_{BL,cogen/trigen}}\right)\right] \times EF_{FF,CO2}$$

Where:

$BE_{cogen/trigen,CO2,y}$ = Baseline emissions from electricity and thermal energy displaced by the project activity during the year y (t CO2)

$EG_{PJ,electrical,y}$ = Amount of electricity supplied by the project activity during the year y; (GWh)

3.6 = Conversion factor (TJ/GWh)

$EG_{PJ,thermal,y}$ = Net quantity of thermal energy supplied by the project activity during the year y (TJ)

$EF_{FF,CO2}$ = CO2 emission factor of the fossil fuel that would have been used in the baseline cogeneration plant obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used (t CO2/TJ)

$\eta_{BL,cogen/trigen}$ = Total annual average efficiency of the cogeneration or trigeneration plant using fossil fuel determined as per paragraph 39 or 40

Steam generation capacity of boiler	50	TPH
Working Days in a year	365	days
Run hrs in a year	8,760	Hrs
PLF	80%	
Annual steam generation	350400	ton
Steam pressure at TG outlet	3.5	kg/cm2
Enthalpy of dry saturated steam at 3.5 kg/cm2	2743.35	kJ/kg
Enthalpy of feed water at @126 Deg C	529.366	kJ/kg
Thermal energy supplied by steam	961.27	TJ
Thermal energy of feed water	185.49	TJ
EG PJ,thermal (Net thermal energy supplied by steam)	775.78	TJ

$EG_{PJ,thermal,y}$ = 775.78 TJ

Installed electrical capacity of project = 4 MW

Annual electricity generation = 4 x 250x 24 x 80% = 28032 MWh

Auxiliary consumption = 10% of generation as per APERC tariff order 06/08/2013, pg. 2

Net electricity generation by project = 25.2288 GWh

$EG_{PJ,electrical,y}$	= 25.2288 GWh
$\eta_{BL,cogen/trigen}$	= 85% (using default efficiency of new coal fired boiler as per 'Tool to determine the baseline efficiency of thermal or electric energy generation systems', Ver. 01, EB 48, Annex 12 and taking steam turbine efficiency of 100% as per Para 29(b) of SSC methodology)
$EF_{FF,CO2}$	= 95.80 tCO2/TJ (as per Central Electricity Authority (CEA) CO2 Baseline Database for the Indian Power Sector; Ver. 08)
Hence, $BE_{cogen/trigen,CO2,y}$	= 97,671 **tCO2**

3.2 Project Emissions

Project emissions shall be calculated using the following equation

$$PE_y = PE_{FF,y} + PE_{Ec,y} + PE_{Geo,y} + PE_{ref,y} + PE_{cultivation,y}$$

Where,

PE_y	: Project emissions from the project activity during the year y (t CO2)
PE_{FFy}	: Project emissions from fossil fuel consumption during the year y (t CO2)
$PE_{EC,y}$	: Project emissions from electricity consumption during the year y (t CO2)
$PE_{Geo,y}$	: Project emissions from a geothermal project activity in year y (t CO2)
$PE_{ref,y}$	: Project emissions from use of refrigerant in project activity in year y (t CO2)
$PE_{cultivation,y}$	: Project emissions from cultivation of biomass in a dedicated plantation in year y (t CO2e)

For this project activity,
$PE_{Geo,y} = PE_{ref,y} = PE_{cultivation,y} = 0$

Emissions from fuel consumption

CO2 emissions from on-site combustion of fossil fuels ($PE_{FF,y}$) shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

Though the project activity will not use any fossil fuels, a provision is made to monitor fuels used during the verification period. As per Equation 1 of "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" version 3.0:

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

Where,

$PE_{FC,j,y}$	= Are the CO2 emissions from fossil fuel combustion in process j during the year y (tCO2/yr)
$FC_{i,j,y}$	= Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	= Is the CO2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)
i	= Are the fuel types combusted in process j during the year y

The CO2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two Options, depending on the availability of data on the fossil fuel type i, as follows:

- **Option A**: The CO2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type i
- **Option B**: The CO2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO2 emission factor of the fuel type i

PP has chosen option B.

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,
$COEF_{i,y}$ = Is the CO2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)
$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = Is the weighted average CO2 emission factor of fuel type i in year y (tCO2/GJ)
i = Are the fuel types combusted in process j during the year y

Emissions from electricity consumption

The project activity will use electricity generated in the project cogeneration plant and net electricity after this auxiliary consumption will be monitored for emission reduction calculation. However, during cold start-up of the project plant, electricity from grid will be used. The electricity consumption will be monitored using electricity meter during the crediting period.

CO2 emissions from electricity consumption ($PE_{EC,y}$) shall be calculated using the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". Accordingly, for the project activity:

$$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y})$$

Where,
$PE_{EC,y}$ = Project emissions from electricity consumption in year y (t CO2 / yr)
$EC_{PJ,j,y}$ = Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EF,j,y}$ = Emission factor for electricity generation for source j in year y (t CO2/MWh)
$TDL_{j,y}$ = Average technical transmission and distribution losses for providing electricity to source j in year y

$EC_{PJ,j,y}$ is measured as electricity taken from grid for the cogeneration plant start up/ emergency operations. The transmission and distribution losses are calculated using the recent, accurate and reliable data available within the host country. The transmission and distribution losses in state in 2011-12 were 9.98%[4].

Determination of $EF_{EF,j,y}$

As per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption Version 03.0, EB 96 Annex 5", "Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s)" is applicable for the project activity. Within Scenario C, "Case C.III: Electricity from both the grid and captive power plant(s)" represents the project scenario, as it uses grid and an onsite DG set.

As per para 31 of Tool to calculate baseline, project and/or leakage emissions from electricity consumption, "*Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B, respectively. This means that*

[4] http://indianexpress.com/article/business/business-others/transmission-distribution-losses-in-andhra-pradesh-dip-to-9-98-per-cent-4373142/

the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."
From Scenario A, Option A1 is chosen "Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system".

As per Methodological tool: Tool to calculate the emission factor for an electricity system (Version 06.0, EB 97, Annex 7), following six steps have been followed:

(a) **Step 1:** Identify the relevant electricity systems;
(b) **Step 2:** Choose whether to include off-grid power plants in the project electricity system (optional);
(c) **Step 3:** Select a method to determine the operating margin (OM);
(d) **Step 4:** Calculate the operating margin emission factor according to the selected method;
(e) **Step 5:** Calculate the build margin (BM) emission factor;
(f) **Step 6:** Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems
As described in tool *"For determining the electricity emission factors, the project participants shall identify the relevant project electricity system. Similarly, the project participants shall identify any connected electricity systems."* The Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern. However, all the 5 zones have now been synchronized and called as Indian Grid.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

The Project Participant has chosen only grid power plants in the calculation.

Step 3: Select a method to determine the operating margin (OM)
The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:
(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/ must-run sources. In the context of the methodology low cost/must-run resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

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

	2011-12	2012-13	2013-14	2014-15	2015-16
India	19.6%	16.9%	18.6%	16.8%	15.1%

Data Source: Central Electricity Authority (CEA) database Version 12, May '2017

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of

the total generation. Thus the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (t CO2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

(a) **Ex ante option:** if the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

OR

(b) **Ex post option:** if the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

PP has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

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

The operating margin emission factor has been calculated using a 3 year data vintage:

Net Generation in Operating Margin (GWh) (incl. imports)		
2013-14	**2014-15**	**2015-16**
721,632	808,417	871,740

Simple Operating Margin Emission Factors (tCO2/MWh) (incl. Imports)		
2013-14	**2014-15**	**2015-16**
1.0002	0.9903	0.9655

Weighted Generation Operating Margin (t CO2/MWh)	**0.9843**

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid,BM,y}$)
As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 06.0, EB 97, Annex 7) para 73:

In terms of vintage of data, project participants can choose between one of the following two options:
(a) ***Option 1*** *- for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.*

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

Option 1 as described above is chosen by PP to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
	2015-16
Indian Grid	**0.9083**

Step 6: Calculate the combined margin (CM) emission factor
As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 06.0, EB 97, Annex 7) para 82:

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:
(a) Weighted average CM; or
(b) Simplified CM.

PP has chosen option (a) i.e., weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

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

Where:
$EF_{grid,BM,y}$ = Build margin CO2 emission factor in year *y* (t CO2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year *y* (t CO2/MWh)
w_{OM} = Weighting of operating margin emissions factor (per cent)
w_{BM} = Weighting of build margin emissions factor (per cent)

The following default values should be used for w_{OM} and w_{BM}:
(a) Except for Wind and solar power generation project activities: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period and for subsequent crediting periods

Therefore,
$EF_{EF,j,y}$ = $EF_{grid,CM,y}$ = **0.9462** CO2/MWh

Thus, it is envisaged that PE_y = **0** tCO2

However, this calculation is only for ex-ante estimate and actual value will be calculated in the monitoring periods.

3.3 Leakage

As per the applied methodology AMS I.C. version 20, leakages can be considered as per para 76 and 77 as mentioned below:

Para 76: *If the energy generating equipment currently being utilised is transferred from outside the boundary to the project activity, leakage is to be considered.*
The energy generating equipment is purchased from OEM and is not transferred from outside the boundary to the project activity. Thus, this leakage need not be considered here.

Para 77: *In cases where the collection, processing and transportation of biomass residues is outside the project boundary and due to the implementation of the project activity biomass residues are transported over a distance of 200 kilometres CO2 emissions from the collection, processing and transportation of biomass residues to the project site shall be taken into account as leakage using with the latest version of tool "Project and leakage emissions from transportation of freight".*

The biomass used in the project activity also transported within project plant as only in-house generated biomass fuel will be used in the project. Thus, leakage related to biomass collection/processing/ transport are also not involved.

As per the table 1 of Attachment C to Appendix B, the emission sources for the biomass residues are the competing use of biomass. Competing uses of biomass is the emission source which could be led due to the use of biomass elsewhere in the absence of the project activity. The assessment of this emission source is further explained in the Para 18 of Attachment C to Appendix B,

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

This project uses biomass residue generated within the project facility (by product of the palm oil mill for which the project is supplying steam and electricity dedicatedly). Thus, the PP would not have sold this biomass in market and thus there is no competing use.

Further, the West Godavari district and 50 km area where project is located has mainly agro based industries[5] – sugar cane crushing, rice, cotton processing. Thus, the biomass availability is abundant. Further, GAVL has 2.5 MW co-generation unit near to the project which is already registered in VCS, id 1315. The project has sufficient availability of biomass in the region.

Hence, this leakage is not applicable.
Thus,
LE_y = **0** tCO2

Emission reductions are calculated as follows:
$ER_y = BE_y - PE_y - LE_y$

Where,
ER_y : Emission reductions in year y (tCO2e)
BE_y : Baseline emissions in year y (tCO2e)
PE_y : Project emissions in year y (tCO2)

[5] http://dcmsme.gov.in/dips/amended%20West%20Godavari.pdf

LE_y : Leakage emissions in year y (tCO2)

ER_y = 97,671 + 0 + 0
= 97,671 tCO2e

3.4 Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2018	97,671	0	0	97,671
2019	97,671	0	0	97,671
2020	97,671	0	0	97,671
2021	97,671	0	0	97,671
2022	97,671	0	0	97,671
2023	97,671	0	0	97,671
2024	97,671	0	0	97,671
2025	97,671	0	0	97,671
2026	97,671	0	0	97,671
2027	97,671	0	0	97,671
Total	976,710	0	0	976,710

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$\eta_{BL,cogen/trigen}$
Data unit	%
Description	Total annual average efficiency of the cogeneration plant using coal
Source of data	Default efficiency of new coal fired boiler as per Appendix of the applied methodology and taking steam turbine efficiency of 100% as per Para 40(b)
Value applied	85%
Justification of choice of data or description of	Default value as per applied methodology guidance is used here

measurement methods and procedures applied	Efficiency of a new coal fired boiler = 85% (as per Appendix of applied methodology) Efficiency of turbine = 100% (as per Para 40(b) of applied methodology) Thus, efficiency of cogeneration plant = 85 x 100 = 85%
Purpose of Data	Calculation of baseline emissions
Comments	NA

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	CEA "CO2 baseline database for the Indian Power Sector, Version 12, May 2017[6]"
Value applied	0.9843
Justification of choice of data or description of measurement methods and procedures applied	Calculated using "Tool to calculate the emission factor for an electricity system"
Purpose of Data	Calculation of baseline emissions
Comments	The emission factor will be fixed ex-ante and will not be monitoring throughout the crediting period

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO2/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	CEA "CO2 baseline database for the Indian Power Sector, Version 12, May 2017[7]"
Value applied	0.9083
Justification of choice of data or description of measurement methods and procedures applied	Calculated using "Tool to calculate the emission factor for an electricity system"
Purpose of Data	Calculation of baseline emissions
Comments	The emission factor will be fixed ex-ante and will not be monitoring throughout the crediting period

[6] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf
[7] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO2/MWh
Description	Combined margin emission factor of the Indian grid
Source of data	CEA "CO2 baseline database for the Indian Power Sector, Version 12, May 2017[8]"
Value applied	0.9462
Justification of choice of data or description of measurement methods and procedures applied	Calculated using "Tool to calculate the emission factor for an electricity system"
Purpose of Data	Calculation of baseline emissions
Comments	The emission factor will be fixed ex-ante and will not be monitoring throughout the crediting period

4.2 Data and Parameters Monitored

Data / Parameter	$EF_{CO2,i,y}$
Data unit	tCO2/TJ
Description	CO2 emission factor of fossil fuels: coal and diesel
Source of data	Appendix B of CEA "CO2 baseline database for the Indian Power Sector, Version 12, May 2017[8]"
Description of measurement methods and procedures to be applied	The database is an official publication of the Government of India for the purpose of CDM baselines. Thus, the value is taken as country specific emission factor of coal and diesel.
Frequency of monitoring/recording	Once in a monitoring period – latest database version will be used
Value applied	Coal = 95.80 Diesel: 72.6
Monitoring equipment	Default value
QA/QC procedures to be applied	The data is taken from an official publication of the Government of India for the purpose of CDM baselines and is available from authentic source, thus no additional QC is required
Purpose of data	Calculation of Project Emissions
Calculation method	NA

[8] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

Comments	NA

Data / Parameter	$EG_{PJ,thermal,y}$
Data unit	TJ
Description	Net quantity of thermal energy supplied by project
Source of data	Calculated parameter. Parameter $EG_{PJ,thermal,y}$ for project activity boiler is calculated from net steam output (ton) and its net enthalpy. Source for net steam output is steam production data log and corresponding enthalpy (at operating temperature) is inferred from steam table with respect to operating pressure and temperature.
Description of measurement methods and procedures to be applied	Monitoring: This will be calculated on the monthly basis. The monthly average value of steam flow meter and pressure gauge will be used to calculate enthalpy of the steam supplied using steam table in tonnes/TJ. This value will be multiplied with the monthly average of steam generated by project activity boiler Q_{steam}, to calculate enthalpy of steam supplied in a month. The enthalpy of feed water calculated using the measured values of flow meter (1 number) and its temperature (using meter: 1 number) will be subtracted to get $EG_{PJ,thermal,y}$. The sum of $EG_{PJ,thermal}$ of all the months will provide a yearly value. Data type: Calculated and archived Archiving Procedure: Electronic
Frequency of monitoring/recording	Monitoring Frequency: Continuous measurement for steam flow and pressure Recording Frequency: Monthly calculation for enthalpy
Value applied	531.36
Monitoring equipment	Equipment accuracy class Steam flow meter: ±0.5% Pressure gauges : ± 1%
QA/QC procedures to be applied	The steam temperature and steam mass flow meters will be calibrated once in three years.
Purpose of data	Calculation of Baseline Emissions
Calculation method	Steam generated in a year (ton) x average enthalpy of steam (kJ/kg) / 10^6
Comments	NA

Data / Parameter	$EG_{PJ,electrical,y}$

Data unit	MWh
Description	Net electricity supplied by the project activity
Source of data	Cogen plant log book
Description of measurement methods and procedures to be applied	Monitoring: Electricity meter in control room will measure the net quantity of electricity supplied by the project activity cogen plant. Data type: Measured Archiving procedure: Paper and Electronic Responsibility: Turbine operator would be responsible for monitoring and checks for regular calibration of electricity meter and Shift In-charge will be responsible for calibration of the electricity meters. Calibration Frequency: Once in five years
Frequency of monitoring/recording	Continuous monitoring with monthly recording
Value applied	17,280
Monitoring equipment	Electric meter Accuracy class: 0.2s
QA/QC procedures to be applied	Electric meter/s would be calibrated once in five years at accredited third party laboratory
Purpose of data	Calculation of Baseline Emissions
Calculation method	Total generation from the project activity – auxiliary consumption – import from grid (if any used for cogen plant during cogen plant shutdown). The trivector meter will give net generation directly by doing above calculation.
Comments	NA

Data / Parameter	$B_{biomass,y}$
Data unit	Ton
Description	Quantity of biomass residues of type k consumed in the boiler in year y (tonnes on dry-basis)
Source of data	Measured using weighbridge
Description of measurement methods and procedures to be applied	Will be monitored ex-post. Adjust for the moisture content in order to determine the quantity of dry biomass. If more than one type of biomass fuel is consumed, each shall be monitored separately. For the case of processed renewable biomass (e.g. briquettes) data shall be collected for mass, moisture content, NCV of the processed biomass that is supplied to users with an appropriate sampling frequency

Frequency of monitoring/recording	Monitoring: The quantity of the biomass consumed will be measured using weigh bridge. Data Type: Measured and archived Archiving Procedure: Electronic Responsibility: Stores in-charge will be responsible for maintaining the records of the biomass consumed in project. Stock in charge will maintain a inventory recording the opening and closing balance annually. Cross-check: Cross checking the measurements using mass/energy balance.
Value applied	107354 Tons
Monitoring equipment	Weighbridge Accuracy class: ±1%
QA/QC procedures to be applied	Weigh bridge used will be calibrated by an external agency once in a year.
Purpose of data	Baseline emissions calculations
Calculation method	Sum of quantities of palm fibre consumption in a monitoring period The moisture content in order to determine the quantity of dry biomass will be determined by reputed laboratory.
Comments	The parameter will monitor quantities of all biomass used palm fibre, palm shell and EFB separately

Data / Parameter	$NCV_{k,biomass}$
Data unit	kcal/kg
Description	Net Calorific Value of biomass type k
Source of data	Lab analysis report of NCV
Description of measurement methods and procedures to be applied	Monitoring: The NCV of biomass will be measured once in the first year of the crediting period (3 samples in each quarter) by third party laboratory/ in-house as per national/ international standard. Data Type: Measured and Archived Archiving Procedure: Electronic Recording frequency: once in the first year of the crediting period Responsibility: Chief Chemist will be responsible for getting the lab analysis for the NCV.
Frequency of monitoring/recording	Once in the first year of the crediting period
Value applied	Avg. NCV of Biomass fuel mix (kcal/kg) (55% SEFB+30% Fibre+15% shell) is 3080 kCal/kg
Monitoring equipment	Calorimetry - third party lab analysis

QA/QC procedures to be applied	Average value obtained using third party analysis using three samples for each measurement every quarter in the first year of operation and will be compared with any public literature if available and IPCC default values. If the measurement results differ significantly from previous measurements or other relevant data sources, additional measurements will be conducted.
Purpose of data	Baseline emissions calculations
Calculation method	Calorimetry
Comments	The parameter will monitor NCV of all biomass used palm fibre, palm shell and EFB separately

Data / Parameter	Extracted steam Enthalpy
Data unit	kJ/kg
Description	Enthalpy of exhaust steam at the outlet of the steam turbine
Source of data	Plant log books
Description of measurement methods and procedures to be applied	Calculation Procedure: Enthalpy of steam from turbine is calculated from steam tables based on the corresponding values of quantity of steam and pressure. Data type: Calculated Recording Frequency: Daily Archiving procedure: Paper and/or Electronic Responsibility: Boiler operator would be responsible for monitoring and checks for regular calibration of temperature meter and pressure gauge. The Shift In-charge will be responsible for calibration of the temperature meter and pressure gauge.
Frequency of monitoring/recording	Continuous monitoring with monthly recording
Value applied	2681
Monitoring equipment	Pressure of steam will be measured by pressure gauge and temperature by temperature transducer
QA/QC procedures to be applied	QA/QC procedures will be ensured as the temperature meter and pressure gauge would be calibrated at regular intervals.
Purpose of data	Baseline emissions calculations
Calculation method	Enthalpy of steam at end of TG – enthalpy of feed water
Comments	NA

Data / Parameter	Pressure

Data unit	kg/cm^2
Description	Pressure of flowing exhaust steam at the outlet of steam turbine
Source of data	Pressure gauge
Description of measurement methods and procedures to be applied	Monitoring: Pressure gauge will measure the pressure of the steam at the turbine outlet Data type: Measured and archived Recording Frequency: Hourly Archiving procedure: Paper and Electronic Responsibility: Turbine operator would be responsible for monitoring and checks for regular calibration of pressure gauge and Shift In-charge will be responsible for calibration of the pressure gauge. Calibration Frequency: Calibration will be carried out once in a year.
Frequency of monitoring/recording	Continuous monitoring with monthly recording
Value applied	0.135
Monitoring equipment	Pressure gauge Accuracy class: 1%
QA/QC procedures to be applied	Pressure gauge will be calibrated annually
Purpose of data	Baseline emissions calculations
Calculation method	Direct reading from Pressure gauge
Comments	NA

Data / Parameter	$FC_{i,j,y}$
Data unit	MT/year
Description	Quantity of fossil fuel combusted in the project in year y
Source of data	Measured using weigh bridge for coal and level gauge for diesel
Description of measurement methods and procedures to be applied	Monitoring: Type and quantity of fossil fuel combusted in the project activity will be measured using electronic weigh bridge (or recorded in challans provided by the supplier and handed over to the plant people by the truck driver). Data Type: Continuously Measured and archived Archiving Procedure: Electronic Responsibility: Plant head with Officer (stores) would be responsible for monitoring and checks for regular calibration of weigh bridge
Frequency of	Continuous measurement with monthly recording/ compilation

monitoring/recording	
Value applied	0
Monitoring equipment	Weigh bridge for coal and level guage for diesel Accuracy class: ±1%
QA/QC procedures to be applied	Weigh bridge will be calibrated by an external agency once in a year. The consistency of metered fuel consumption quantities will be cross-checked by an annual energy balance that is based on purchased quantities and stock changes.
Purpose of data	Baseline emissions calculations
Calculation method	Sum of total fuel consumed in boiler
Comments	NA

Data / Parameter	M (Moisture content of the biomass residues)
Data unit	%
Description	Moisture content of each biomass residues type k
Source of data	Onsite measurement
Description of measurement methods and procedures to be applied	The biomass residue moisture content will be monitored and registered by taking periodic samples from each biomass type flow to the power boiler. Humidity content will be calculated by evaporating the water of the samples and measuring the weight before and after the water has been evaporated. This process will be carried out in dedicated scales.
Frequency of monitoring/recording	The moisture content should be monitored for each batch of biomass of homogeneous quality. The weighted average should be calculated for each monitoring period and used in the calculations
Value applied	-
Monitoring equipment	Not applicable. Moisture content will be measured locally, in reputed laboratories.
QA/QC procedures to be applied	-
Purpose of data	To calculate dry basis weight of biomass
Calculation method	-
Comments	-

Data / Parameter	T
Data unit	^{0}C
Description	Temperature of steam generated
Source of data	Plant log book
Description of measurement methods and procedures to be applied	The temperature of steam generated will be measured using temperature gauge on hourly basis, the monthly average value will be applied to calculate enthalpy of steam.
Frequency of monitoring/recording	Every hour reading, monthly recording
Value applied	
Monitoring equipment	Temperature gauge
QA/QC procedures to be applied	Calibration of Temperature transducer will be done as per the applicable national or international standard or manufacturer's specification or at least once in three years
Purpose of data	Calculation of baseline emission
Calculation method	Where relevant, provide the calculation method, including any equations, used to establish the data/parameter
Comments	Data will be archived for crediting period +2 years

Data / Parameter	$NCV_{fossil\ fuels}$
Data unit	kcal/kg
Description	Net Calorific Value of fossil fuels
Source of data	Lab analysis report of NCV
Description of measurement methods and procedures to be applied	Monitoring: The NCV of fossil fuel type if used will be measured once in the year by third party laboratory/ in-house as per national/ international standard. Data Type: Measured and Archived Archiving Procedure: Electronic Recording frequency: once in the first year of the crediting period Responsibility: Chief Chemist will be responsible for getting the lab analysis for the NCV.
Frequency of monitoring/recording	Once in the first year of the crediting period
Value applied	-
Monitoring equipment	Calorimetry – third party lab analysis

QA/QC procedures to be applied	Lab reports from in-house/third party shall be used.
Purpose of data	Baseline emissions calculations
Calculation method	Calorimetry
Comments	The parameter will monitor NCV of all fossil fuels used separately

Data / Parameter	$EC_{PJ,j,y}$
Data unit	MWh
Description	Electricity taken from grid for the cogeneration plant start up/ emergency operations.
Source of data	Cogen plant log book
Description of measurement methods and procedures to be applied	Monitoring: Electricity meter in control room Data type: Measure Archiving procedure: Paper and Electronic Responsibility: Turbine operator would be responsible for monitoring and checks for regular calibration of electricity meter and Shift In-charge will be responsible for calibration of the electricity meters. Calibration Frequency: Once in five years
Frequency of monitoring/recording	Continuous monitoring with monthly recording
Value applied	0
Monitoring equipment	Electric meter Accuracy class: 0.2s
QA/QC procedures to be applied	Electric meter/s are under the control of State utility and PP has no control over it.
Purpose of data	Baseline emissions calculations
Calculation method	The trivector meter will give net generation directly by doing above calculation.
Comments	NA

4.3 Monitoring Plan

The Monitoring and Verification procedures define a project-specific standard against which the project's performance and conformance with all relevant criteria will be monitored and verified. It includes:

- Suitable data collection, collation and archiving methods consistent with good practices
- Data interpretation techniques for monitoring and verification of GHG emissions.

These procedures provide for a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures would be to direct and support

continuous monitoring of the key performance indicator for the project, i.e. Greenhouse Gas (GHG) emission reductions.

All instruments will be calibrated and marked in accordance with information in Section 4.2 so that the accuracy of measurement can be ensured all the time.

The general monitoring principles are based on:

- Frequency of monitoring
- Minimizing uncertainties and increasing reliability of performance of the project by an emergency preparedness plan
- Reporting and archiving the data used in monitoring and accounting for the emission reduction from the Project
- QA/QC

Frequency of monitoring

The project developer has installed all metering facilities within the plant premises. The measurements are monitored as per the frequency described in above sections, and the values of the parameters are recorded in the automatic reports generated by the PLC (only for parameters: Steam flow, Steam pressure and temperature at boiler, feed water temperature) and in log books. The monitored values will be transferred to the excel spreadsheet on monthly basis to prepare monthly reports. These monthly reports are used by the VCS Coordinator to calculate the reduction in GHG emissions and to generate monthly reports that form a necessary component of the Management Information System.

The VCS Coordinator will be responsible for

- Monitoring the project on a day to day basis,
- Co-coordinating with the Sr. Manager/Manager- projects and other internal and external agencies/authorities for the purpose of smooth operation of the project and accrual of emission reduction.

Emergency preparedness plan

The amount of emission reduction units is proportional to the steam generation using the biomass residues in the Project. Measurement devices having good accuracy and procured from reputed manufacturers have been installed at site for the purpose of monitoring the various parameters of the project. Since the reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment for reproducibility, all instruments will be calibrated as per the planned frequency for ensuring reliability of the system.

In the event that a particular instrument malfunctions or breaks down, all efforts will be made to restore or replace that instrument within short span of time of such eventuality. The data used in calculating the emission reduction for that particular parameter will be taken as zero from the last recorded reading.

This will ensure that the uncertainties in the parameters used for calculating the emission reductions from the project are consistent, verifiable and reliable, and any uncertainty is minimal.

Reporting and archiving

Verification is done on the basis of monthly reports that are prepared by the concerned sections covering all the monitoring parameters.

The VCS coordinator will be responsible for

- Collection and updating of all data in the project monitoring worksheet,
- Generation and distribution of monthly reports to the Management accounting for the actual emission reduction achieved during the month,
- Any specific event affecting emission reduction due to the project during the month

- Reporting data on monthly basis for the calculation and estimation of emission reductions.

This data will be checked against initial estimates. If the project is not performing as expected or if there are any negative impacts on the volume of emission reductions obtained, on the basis of the monthly data being monitored, analysis will be carried out to identify where the project is deviating in its generation of emission reductions and the immediate measures will be taken to maintain the expected generation of emission reductions from the operation of this project.

All data will be kept for a minimum of 2 years following last issuance of VCUs or the end of the crediting period, whichever is later, and the storage of this data will be the responsibility of the project proponents.

QA/QC procedures
The quality assurance and quality control over the data monitored will be done by the manager as follows:

- The monitored data will be verified for the completeness and consistency.
- It will be ensured that the plant personnel receive adequate training
- It will be ensured that the equipments in the project activity undergo periodic maintenance as recommended by the manufacturer.
- It will be ensured that the monitoring instruments are calibrated as per the specified frequency.
- It will be ensured that the there is an adequate storage of the data monitored.

Any non-conformance will be identified and a corrective action will be taken.

5 SAFEGUARDS

5.1 No Net Harm

There are no negative environmental and/or socio-economic impacts due to the project.

The project activity does not involve any major construction activity. It primarily requires the installation of boiler and turbine within the project premises, interfacing the generators with the State Electricity Board by setting up HT transmission lines and installation of other accessories.

The report on “Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects” prepared by MNRE dated September 2013. This report clearly mentioned that biomass power project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same[9].

Thus there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the project activity.

5.2 Environmental Impact

As per the EIA notification 2009[10], given by the Ministry of Environment and Forests under the under the Environmental (Protection) Act 1986, the project activity will not fall under the requirement of conducting EIA. The project will not involve any negative environmental impacts,

[9] http://mnre.gov.in/file-manager/UserFiles/report-on-developmental-impacts-of-RE.pdf
[10] http://moef.nic.in/downloads/rules-and-regulations/3067.pdf

as the heat and electricity is being generated using renewable biomass, which is a clean source of energy, thus no EIA study was conducted.

5.3 Local Stakeholder Consultation

The Local Stakeholder Meetings were organized for local stakeholder consultation and informed local stakeholder regarding the meeting on 20/11/2017. The following are the stakeholders for the project activity:

- Local community
- Local village administration
- Technology suppliers
- Local vendors

All the stakeholders have been invited through invitation letters and/ or public notice to attend the stakeholders meeting on 05/12/2017.

In the introductory speech, the representatives of PP welcomed the gathering and given a brief about the VCS project activity. Subsequent to the introductory speech, stakeholders were explained about the electricity generation from power project/ unit is an environmental friendly power generation technology contributing to reduction in GHG emissions. They were also explained about the benefits of the power project/ unit like, increasing energy availability and improving quality of power and its assistance to the local population by providing employment opportunities to both skilled & unskilled labours.

The Minutes of LSH meeting along with List of Attendees and other supporting's have been submitted to the DOE.

5.4 Public Comments

This project was open for public comment from 21 February - 23 March 2018. No comments were received.
http://www.vcsprojectdatabase.org/#/pipeline_details/PL1744