Project design document form
(Version 11.0)

BASIC INFORMATION	
Title of the project activity	Biomass based power project in Punjab, India
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	07
Completion date of the PDD	31/08/2020
Project participants	Dee Development Engineers Pvt. Ltd.
Host Party	India
Applied methodologies and standardized baselines	AMS-I.D. ver. 18.0 - Grid connected renewable electricity generation Standardized baseline: Not Applicable
Sectoral scopes linked to the applied methodologies	1 : Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	47,821 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Dee Development Engineers Pvt. Ltd. (DDEPL) proposes to set up an 8.0 MW independent biomass based power plant at Village Gaddadhob, Firozepur district in Punjab which will generate electricity and supply it to various consumers connected to the regional grid. The project activity will have one 33 TPH capacity boiler with outlet parameters of 465^{o}C temperature and 66 kg/cm^{2} pressure and one bleed cum condensing steam turbine of nominal capacity of 8.0 MW. The steam pressure and temperature at the inlet of turbine will be 64 kg/cm^{2} and 475 ± 5°C respectively.

The purpose of the project activity is to utilize surplus biomass available in the region for effective generation of electricity for supply to the grid to meet the ever-increasing demand for energy in the region. The project activity, by generation of renewable electricity, contributes towards reduction of Green House Gas emissions. In the absence of the project activity, GHG emissions would have occurred for generation of equivalent amount of electricity from the fossil fuel dominated regional grid.

Contribution of the project activity to sustainable development:

The project proponent believes that the biomass based project by virtue of its location in the rural surroundings of Punjab will contribute to the following:

Social well-being:

The project will enhance the purchasing power of the local population by serving as an additional source of income for them by purchasing their crop residue which would otherwise be burnt or underutilized. By preferentially employing the local population in the construction and operation phases of the project, the project would also help create employment opportunities in the region. Further, the local uneducated and underemployed population of the region can be engaged in transportation of the agro waste to and from the project site. The project is expected to employ 70-80 people directly from the local population and 2,000- 2,500 people indirectly in transportation of agro-waste. The project would also significantly improve connectivity of the rural area to nearby locations which would lead to overall development of the region.

Economical well-being:

The project activity would create business opportunities for local stakeholders such as suppliers, manufacturers and contractors. The project activity will also help bridge the demand supply gap in the power deficit regional grid. This kind of decentralized power generation helps reduce transmission losses and also ensures reliability of power supply which leads to overall prosperity in the region by encouraging more industries to come up in that area.

Environmental well-being:

The project activity reduces GHG emissions which would have occurred in the absence of the project activity due to generation of electricity in the fossil fuel based generating stations. The project activity is a step towards environmental sustainability by saving exploitation and depletion of a natural, finite and non-renewable resources like coal/gas.

Technological well-being:

The technology selected for the power plant uses a steam turbo generator with a matching boiler capable of firing multiple fuels and is modern, energy efficient and environmentally safe and sound. The generation of electricity from the project leads to strengthening of the grid, increasing the

energy availability and quality of power in the nearby rural areas thereby meeting the energy demand to a certain extent leading to technological well being.

A.2. Location of project activity

Host Party (ies): India

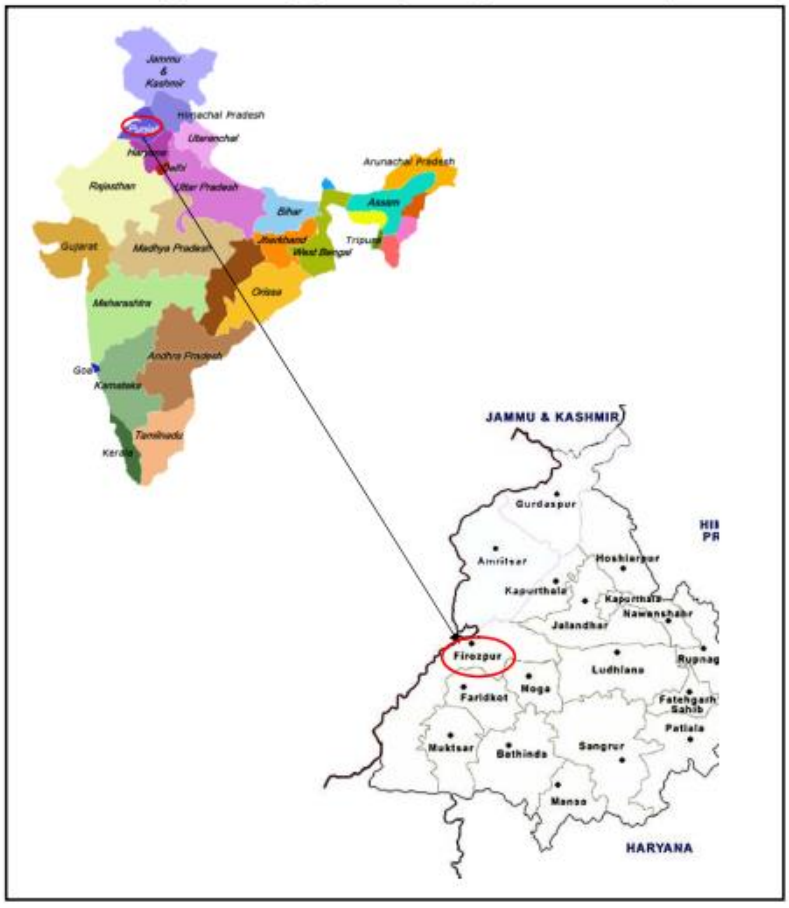
Region/State/Province: Punjab

City/Town/Community: Firozpur district, Tehsil Abohar, Village Gaddadhob

The project activity is located in

Village: Gadda Dhob
Tehsil: Abohar
District: Firozpur
Latitude 30° 13' 59" N
Longitude 74° 21' 08" E.

The nearest railway station to the project activity is Firozpur Cantonment Railway Station.



A.3. Technologies/measures

The project activity involves the installation of a new biomass based power plant to generate zero emission electricity that would be supplied to various consumers connected to the grid. In the baseline scenario the same quantity of energy would have been generated in the northern grid which is dominated by fossil-fuel based power plants and would lead to emission of greenhouse gases.

The proposed system will consist of one no. of High-pressure boiler of capacity 33 TPH, pressure 66 kg/cm^2, and temperature 465°C. The boiler will be designed for firing a variety of biomass and will be designed for outdoor installation. The boiler will contain sub systems like pressure parts, feeding system, draft system, feed water system, ESP and chimney.

The proposed plant will contain one no. bleed cum condensing steam turbine of nominal capacity 8.0 MW. The steam pressure at the inlet of the turbine will be 64 kg/cm^2 and temperature 475 ± 5°C. The rated turbo generator speed will be 7,500 rpm and would be coupled with the generator through a reduction gear unit. Steam will be admitted into the turbine through an emergency stop valve actuated by hydraulic cylinders. The turbine will be coupled with the generator through a reduction gear unit. The turbine will be multistage, nozzle governed, horizontal spindle, two bearings, impulse type bleed cum condensing steam Turbine. All casing will be horizontal split and the design will be such as to permit examination of the blading without disturbing shaft alignment or causing damage to the blades.

Apart from the boiler and turbo generator, the power plant will consist of fuel handling system, boiler feed water system, cooling water system, electrical system, power evacuation system, control system, utilities like compressed air system, ash handling system, fire protection system etc.

The ash handling system is provided for ash collected from: Boiler bank hopper, plenum chamber, air heater hoppers, ESP hoppers. The ash collected in the plenum chamber would be stored manually in a suitable manner.

The technical details of the major mechanical equipment are summarized as follows:

Equipments	**Unit**	**Specifications**
Boiler	Number of Boilers	1
	MCR capacity	33TPH
	Steam pressure	66kg/cm^2
	Steam temperature	465^{o}C
	Feed water inlet temperature	105^{o}c
Turbo Generator	Rated Power	8,000 ± 5%[1] kW
	Rated Speed	7,500 rpm
	Inlet steam pressure	64 kg/cm^2
	Inlet steam temperature	475 ± 5°C
Condensate Extraction Pump	Number	Two
	Type	Centrifugal
	Capacity	35 m^3/hr
Cooling Tower	Number	1
	Capacity	2,500 m^3 /hr
	Supply Temperature	32°C
	Return Temperature	41°C
Boiler feed pump	Number	Two
	Capacity	40 m^3/hr

[1] The actual power generation by the turbo generator can vary by ± 5% compared to design value.

Deaerator	Type	Spray cum tray
	Capacity	40 TPH
DM Water Plant	Capacity	8 m^3/hr
	Regeneration	8 hrs/day

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host Party)	Dee Development Engineers Pvt. Ltd.	No

A.5. Public funding of project activity

No public funding from parties included in Annex 1 to the Convention is involved in the project activity.

A.6. History of project activity

In accordance with the "Guidance on the demonstration and assessment of prior consideration of the CDM", Version 03 (EB49, Annex 22), for project activities with a start date before 2 August 2008, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, the serious consideration of CDM in the decision to proceed with the implementation of the project activity is demonstrated below:

a) The project proponent is already operating a similar biomass based CDM project [2] in Muktsar, Punjab under a Special Purpose Vehicle called Malwa Power Pvt. Ltd. (MPPL). The successful realisation of CDM revenue for the Project Activity at Muktsar prompted the Project Proponent to implement another biomass based project at Firozpur i.e. the project activity under consideration. This clearly demonstrates that the Project Proponent was well aware of CDM at the time of project decision making process and seriously considered CDM in the decision to implement the project activity.

b) This can be further confirmed from the minutes of meeting of the Board of Directors of Dee Development Engineers Pvt. Ltd. held on 25/04/2007 wherein the Board decided to implement the project activity with due consideration of CDM and specifically authorized its personnel to take serious actions to get the project registered.

c) The following timeline of implementation of the project activity along with the timeline of events and actions taken to achieve CDM registration clearly indicate that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation:

Implementation Timeline of project activity

Event	Date	Reference Document
Board Resolution to implement new biomass based power plant considering CDM Revenue in Ferozpur District of Punjab	25/04/2007	Extract from proceedings of the Board of Directors of DDEPL
Request for permission for change of land use	18/08/2007	Letter to The Chief Town Planner, Chandigarh, Punjab
Purchase order for Design,	27/08/2007	Purchase Order placed by DDEPL dated 27

[2] https://cdm.unfccc.int/Projects/DB/TUEV-SUED1142618808.04/view

Manufacture & Supply of bleed cum condensing TG set with Accessories		August 2007
Purchase Order for supply of 1 x 33.0 TPH, 66 Kg/cm^2 (g), 485 C husk fired AFBC (Open Hopper Bottom design) Boiler.	10/09/2007	Purchase Order placed by DDEPL dated 10 September 2007
Approval of Detailed Project Report for setting up of 8.0 MW Biomass Power Plant at Village Gaddadhob, Firozepur district by PEDA	15/11/2007	Letter from Punjab Energy Development Agency
Terms of reference for preparing draft EIA from MoEF	14/12/2007	Letter from PPCB to State Level EIA authority
Approval of Site by Department of Labour	28/01/2008	Letter form Government of Punjab, Department of Labour
Depositing money for Land Use	12/02/2008	Letter from Chief Town Planner, Punjab, Chandigarh
No Objection Certificate from Pollution Angle	19/02/2008	No Objection Certificate from Punjab Pollution Control Board
Permission for change of land use from Chief Town Planner, Chandigarh	25/02/2008	Letter from The Chief Town Planner, Punjab, Chandigarh
Construction start date for biomass based power project	12/04/2008	Contract for Civil, Structure and Allied Works for Biomass based power project
Loan Sanction Letter from Bank of India, Faridabad SSI Branch	27/05/2008	Loan Sanction letter from Bank of India with Ref. FSSI/GLB/33
Implementation agreement between DDEPL and PEDA	09/07/2008	Implementation Agreement with Ref. No. 00AA283577
Invitation letter for Stakeholder Meeting	15/07/2008	Invitation letter for Stakeholder Meeting
Stakeholder Meeting to invite comments	22/07/2008	Letter from PPCB to State Level EIA authority Attendance Record for Stakeholder Meeting
Letter from State Expert Appraisal Committee discussing environmental clearance of the project	24/10/2008	Letter from State Expert Appraisal Committee, Government of Punjab Ref No. SEAC/107/39442

Timeline of events and actions taken to achieve CDM registration

Event	Date	Reference Document
Registration of project "Biomass based independent power project at Malwa Power Private Limited, Mukatsar, Punjab" under CDM by DDEPL under an SPV called MPPL	30/04/2006	http://cdm.unfccc.int/Projects/DB/TUEVSUED1142618808.04/view
Contact with CDM Consultant for CDM Advisory services for project activity	23/03/2007	Letter to CDM Consultant Ref. No. DDE/GEN/E&Y/01
Further communication with CDM Consultant for CDM Advisory services for project activity	10/04/2007	Letter to CDM Consultant Ref. No. DDE/GEN/E&Y/02
Board Resolution to implement new biomass based power plant considering CDM Revenue	25/04/2007	Extract from proceedings of the Board of Directors of DDEPL
Confirmation to CDM Consultant for CDM Advisory services	25/06/2007	Letter to CDM Consultant Ref. No. DDE/GEN/E&Y/05
Invitation letter for Stakeholder Meeting	15/07/2008	Invitation letter for Stakeholder Meeting

Stakeholder Meeting to invite comments	22/07/2008	Letter from PPCB to State Level EIA authority Attendance Record for Stakeholder Meeting
Application to MoEF for DNA Approval of project activity	15/09/2008	Letter to MoEF for DNA Approval
Work Order to DOE for Validation of project activity	11/10/2008	Work Order placed with DOE for validation
Submission of PDD to DOE for Validation	05/11/2008	-
Start of Webhosting of PDD for GSP	14/11/2008	http://cdm.unfccc.int/Projects/Validation/DB/NIFF5BUJQFJTFCD3WFVO0YHB47EUDU/view.html
Meeting of the NCDNA for DNA Approval of project activity	17/11/2008	Invitation letter from MoEF Climate Change Division dated 7/11/2008
Validation site visit by DOE	25/11/2008 to 26/11/2008	Audit Schedule from DOE
End of Webhosting of PDD for GSP	13/12/2008	http://cdm.unfccc.int/Projects/Validation/DB/NIFF5BUJQFJTFCD3WFVO0YHB47EUDU/view.html
Issue of Host Country Approval by DNA	27/01/2009	Host Country Approval letter F.No 4/27/2008-CCC

As can be seen from the timeline above, a gap of 2 years has never been exceeded between documented evidence in accordance with paragraph 6(b) of "Guidance on the demonstration and assessment of prior consideration of the CDM", Version 03 (EB49, Annex 22).

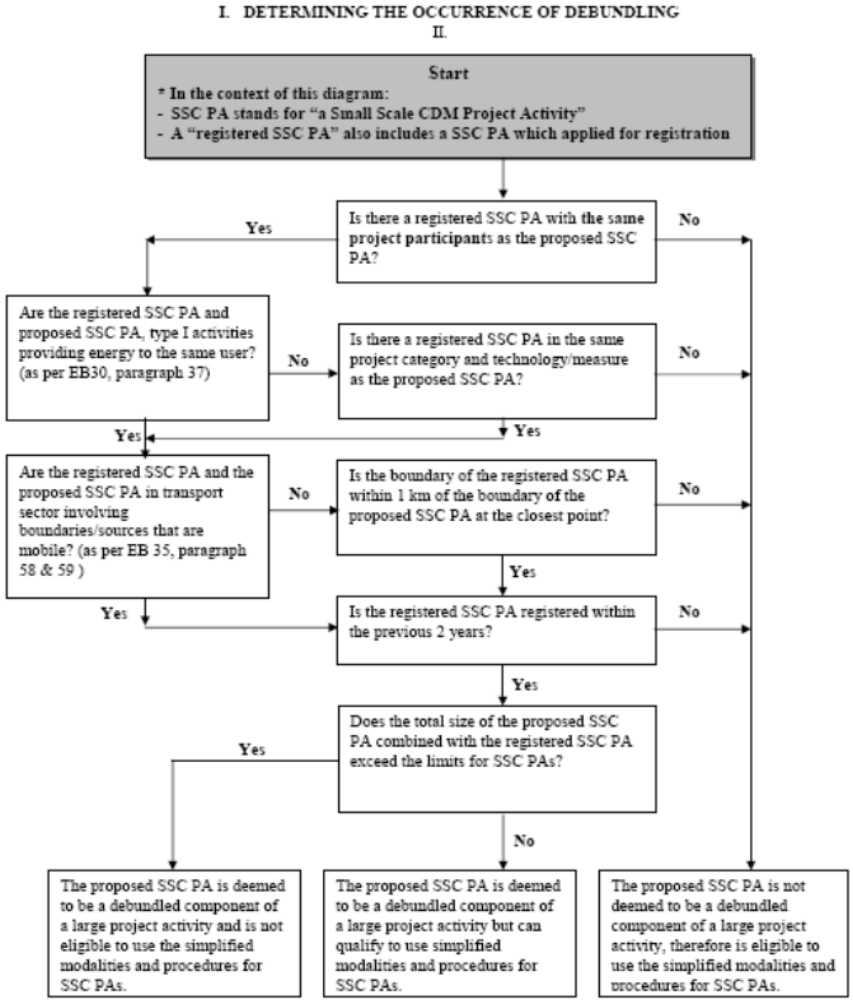
A.7. Debundling

According to Appendix C, paragraph 2 of Simplified Modalities & Procedures for small scale CDM project activities, a proposed small-scale project activity shall be deemed to be a de-bundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

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

The project activity qualifies for the use of simplified modalities and procedures for small-scale CDM project activities as there is no registered small scale project or any submission of application to register another small scale activity by DDEPL whose project boundary is within 1 km of the project boundary of the proposed small-scale project activity.

As per "Compendium of guidance on the debundling for SSC project activities" Version 01, the procedure for determining occurrence of bundling is as given below:



- Is there a registered SSC Project Activity with the same project participants as the proposed SSC PA?
    - Yes (Project Reference No. 0331 – "Biomass based independent power project at Malwa Power Private Limited, Mukatsar, Punjab")

- Are the registered SSC Project Activity and proposed SSC Project Activity, type I activities providing energy to the same user? (as per EB30, paragraph 37)
    - Yes (Both projects provide energy to the Northern Grid)

- Are the registered SSC Project Activity and the proposed SSC Project Activity in transport sector involving boundaries/sources that are mobile? (as per EB 35, paragraph 58 & 59)
    - No

- Is the boundary of the registered SSC Project Activity within 1 km of the boundary of the proposed SSC Project Activity at the closest point? o No (Project Reference No. 0331 is located at Village Gulabewalla , Tehsil Mukatsar, District Mukatsar whereas the proposed project activity is located at Village Gaddadhob, Tehsil Abohar, District Firozpur. The distance between the project activity and the already registered project is much more than 1 km.)

Hence, the proposed SSC PA is not deemed to be a debundled component of a large project activity, therefore is eligible to use the simplified modalities and procedures for SSC PAs.

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

Scope 01 – Energy Industries (Renewable /non-renewable sources)

Methodology: AMS-I.D. "Grid connected renewable electricity generation" (Version 18.0)[3]

The methodological tool also used here:
Tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0)[4]

B.2. Applicability of methodologies and standardized baselines

In accordance with Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project is categorized as Type I.D. Version 18, Scope 1; Grid connected renewable electricity generation. Category I.D. is applicable to projects generating electricity from renewable energy technologies and supplying the electricity to grid.

The project activity generates power through a renewable source of energy (biomass) and supplies it to the regional grid. This electricity would, otherwise, have been generated through fossil fuel sources connected to electricity grid. The project activity has an installed capacity of 8.0 MW which will remain less than the maximum qualifying capacity of 15 MW for a small scale CDM project activity under Type-I of the small scale methodologies. The installed capacity will not increase throughout and even after the crediting period therefore the project activity will remain within the limit of small scale in each year of the crediting period. The project status is corresponding to the methodology AMS-I.D and applicability of methodology AMS-I.D are discussed below:
The project activity meets the applicability conditions of the selected methodology.

Applicability conditions of AMS-I.D. (Version 18)	**Eligibility of project under consideration**
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:[5] (a)Supplying electricity to a national or a regional grid; or (b)Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The project activity involves renewable energy generation by renewable biomass and subsequent export to primary fossil fuel fired regional electricity distribution system; hence it satisfies this applicability criteria.
2. Illustration of respective situations under which each of the methodology (i.e. AMS- I.D., AMS-I.F and AMS- I.A) applies is included in Table 2[6].	The project is installation of new biomass based electricity generation plant that supplies electricity to national/regional grid. Hence option 1 i.e. AMS-I.D. is applicable

[3] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

[4] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

[5] Refer to EB 23, annex 18 or the definition of renewable biomass.

[6]

3, This methodology is applicable to project activities that (a) install a Greenfield plant); (b) involve a capacity addition [7] in an existing plant(s); (c) involve a retrofit[8] of (an) existing plant(s); or (d) involve a rehabilitation[9] of (an) existing plant(s)/unit(s) (d) involve a replacement[10] of (an) existing plant(s).	The project is installation of new biomass based electricity generation plants (not addition to existing system). Option a is applicable.
4. Hydro power plants with reservoirs [11] that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir. • The project activity is implemented in an existing reservoir [12] , where the	The project activity is a biomass based power generation project. Hence this criteria is not applicable to the project activity.

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid[6] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

[7] A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant besides the existing power plant/units; or (ii) The installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

[8] Retrofit or modification is an investment to repair or modify existing operating power plants/units, with the purpose to increase the efficiency, performance or power generation capacity of the plants/units, without adding new power plants/units. A retrofit restores the installed power generation capacity to or above its original level. Retrofits shall only include measures that involve capital investments and not regular maintenance or housekeeping measures.

[9] Rehabilitation is an investment to restore existing power plants/units that was severely damaged or destroyed due to foundation failure, excessive seepage, earthquake, liquefaction, or flood. The primary objective of rehabilitation or refurbishment is to restore the performances of the facilities. Rehabilitation may also lead to increase in efficiency, performance or power generation capacity of the power plants/units with/without adding new power plants/units;

[10] Replacement. involves investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The installed capacity of the new plant or unit is equal to or higher than the plant or unit that was replaced.

[11] A reservoir is a water body created in valleys to store water generally made by the construction of a dam.

volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4W/m^2; The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	
5. If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel,[13]the capacity of the entire unit shall not exceed the limit of 15 MW.	The project has a total capacity of 8.0 MW. The unit has no non-renewable components or provision for future addition of a co-fired fossil fuel system. Thus, the project activity satisfies the eligibility condition of the methodology.
6. Combined heat and power (co-generation) systems are not eligible under this category.	The project activity does not involve cogeneration and hence it satisfies the applicability criteria.
7. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[14] from the existing units.	This condition is not applicable to the proposed project activity as it is a greenfield project activity and does involve the addition of renewable energy generation units at an existing renewable power generation facility
8. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.	This condition is not applicable to the project activity as it is not a modification/ retrofit measure in an existing power plant.
9. 9. In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMSI.C.: Thermal energy production with or without electricity" shall be explored.	The project activity is a renewable biomass based electricity generation project and does not involve methane recovery in landfill gas, waste gas, waste water treatment and agro-industries; Hence the criteria is not applicable to the project activity.

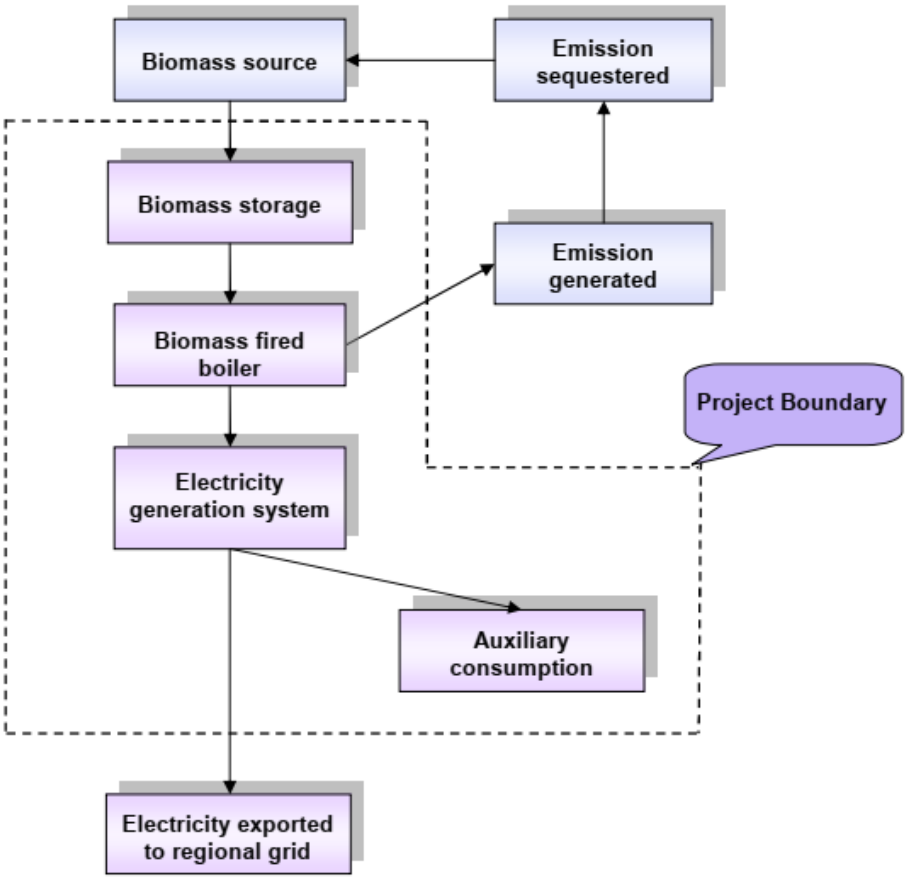
[12] A reservoir is to be considered as an "existing reservoir" if it has been in operation for at least three years before the implementation of the project activity.

[13] A co-fired system uses both fossil and renewable fuels, for example the simultaneous combustion of both biomass residues and fossil fuels in a single boiler. Fossil fuel may be used during a period of time when the biomass is not available and due justifications are provided.

[14] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

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

As per the paragraph 18 of AMS-I.D. Version 18.0 , project boundary encompasses the physical and geographical site of the renewable generation source. The project boundary covers the biomass based power plant, which starts from the biomass storage to the point of power supply to the grid / licensee. Thus, project boundary includes biomass storage, biomass fired boiler, electricity generation from the power production system and auxiliary consumption. The project boundary is illustrated in the following diagram:



Gases and Sources considered in the project boundary

The table provided below shows the gases and sources considered in the project activity

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project	For dry or flash steam geothermal	CO_2	No	Not applicable as project activity is biomass power project.

Source		Gas	Included?	Justification/Explanation
	power plants, emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CH_4	No	Not applicable as project activity is biomass power project.
		N_2O	No	Not applicable as project activity is biomass power project.
	For binary geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	Not applicable as project activity is biomass power project.
		CH_4	No	Not applicable as project activity is biomass power project.
		N_2O	No	Not applicable as project activity is biomass power project.
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	CO_2	No	Not applicable as project activity is biomass power project.
		CH_4	No	Not applicable as project activity is biomass power project.
		N_2O	No	Not applicable as project activity is biomass power project.
	CO_2 emissions from combustion of fossil fuels for electricity generation in thermal power plants and geothermal power plants	CO_2	No	Not applicable as project activity is biomass power project.
		CH_4	No	Not applicable as project activity is biomass power project.
		N_2O	No	Not applicable as project activity is biomass power project.
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Not applicable as project activity is biomass power project.
		CH_4	No	Not applicable as project activity is biomass power project.
		N_2O	No	Not applicable as project activity is biomass power project.

B.4. Establishment and description of baseline scenario

Updated baseline for the second crediting period in line with the “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period.” Version 03.0.1.

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 274 to 295 of Project Standard version 02.0.

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances
The baseline scenario identified at the validation of the project activity was the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid connected power plants and by the addition of new generation sources into the grid. Thus this project activity was a voluntary investment which intends to replace equivalent amount of electricity at grid from renewable source. PP was not bound to incur this investment; hence absence of project activity (i.e. the investment) does not lead to any continued baseline practice for PP within their scope whereas the continued operation of the project activity would continue to replace equivalent amount of electricity at grid. Hence, the same baseline as identified in the previous crediting period is still valid for the project. Therefore, the assessment of the changes in market characteristics is not required for the renewal of the project's crediting period under CDM.

Nevertheless, there is an impressive growth attained by the Indian Power Sector within the recent years, the installed capacity has grown from mere 1,713 MW in 1950 to 356,100.20 MW as on 31.03.2019, consisting of 226279.34 MW Thermal, 77641.63 MW Renew and 6,780 MW Nuclear. Sector-wise details of installed capacity are shown in Table 1. However, it is evident from Table 1[15] that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. Hence, there exists scope for reducing the CO_2 emissions in the country by increased use of renewable energy sources.

Furthermore, project participant has considered the latest available CO_2 Baseline Database (CEA database, version 15) at the time of requesting renewal of the crediting period for establishing the baseline emission factor, which itself considered all the new circumstances. Hence, the new circumstances do not have an impact on the baseline emission. As per below table, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original.
Table 1: Sector- wise installed capacity (MW) as on 31/03/2019 (CEA Database version 15)[16]

Sector	Thermal				Nuclear	Hydro	RES	Total
	Coal	Gas	Diesel	Total				
State	65366.50	7118.71	363.93	72849.14	0.00	29878.80	2347.93	105075.86
Central	58820.00	7237.91	0.00	66057.91	6780.00	12126.42	1632.30	86596.63
Private	76518.00	10580.60	273.70	87372.30	0.00	3394.00	73661.40	164427.70
All India	200704.50	24937.22	637.63	226279.34	6780.00	45399.22	77641.63	356100.19

Thus current baseline remain same and there is no impact if circumstances, existing at the time of requesting renewal of crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

[15] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

[16] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

This sub-step should is applicable here because the baseline scenario identified at the validation of the project activity is the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.

If the baseline scenario of the project activity is the continuation of use of the current equipment(s) without any investment and the projects proponents or third party(ies) will undertake an investment later, but before the end of a crediting period, then the current baseline needs to be updated for that crediting period or the crediting of emission reductions should be limited to the period before the baseline equipment would cease its operation.

Determination of remaining lifetime of the project activity is done by using "Tool to determine the remaining lifetime of equipment" version 01, EB 50, Annex 14 and option (a) is used here i.e. Use manufacturers information for the technical lifetime of equipment and compare to the date of first commissioning for the major equipment like boiler and turbine.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that "Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity."

In the context of the present project activity the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

As evident from the explanation provided above the baseline scenario remains unchanged. Only the approach used to calculate the baseline emission factor is updated as per the latest version of CEA database available at the time of PDD submission for renewal.

In line with the project standard version 02.0, the impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant EB guidance with regard to renewal of the crediting period at the time of requesting renewal of crediting period; and the correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period

Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity

The Government of India enacted the Electricity Act in the year 2003 to harmonize and rationalize the provisions in the existing laws. The Act consolidated the laws relating to generation, transmission, distribution, trading and use of electricity. With the Enactment of the act, the then existing laws viz, The Indian Electricity Act 1910, The Electricity Supply Act, 1948 and The Electricity Regulatory Commissions Act, 1998 were repealed. The Electricity Act 2003 was in force at the time of the completion of the baseline study for the registered PDD.

Section 3 of the said act required the Central Government to prepare the national electricity policy and tariff policy, in consultation with the State Governments and the Authority for development of

the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. In accordance with the section 3 of the Electricity Act 2003, the Central Government notified the National Electricity Policy[17] on 12th February 2005 which was in force at the time of completion of the baseline study as stated in the registered PDD of the project activity. This policy has not been revised since then and is currently in force as well.

In addition to the above policies, State Electricity Regulatory Commissions (SERCs) have announced preferential tariffs and Indian Renewable Energy Development Agency (IREDA) provides term loan assistance towards establishing biomass power projects. All these fiscal and financial incentives were in force at the time of completion of the baseline study for the registered PDD of the project activity and still continue to exist.

The state electricity regulatory commission issues tariff order in respect of procurement of power generated from biomass power plants and there is no mandatory national and/or sectoral policies have come into effect that would affect the compliance of the current baseline. Hence, it can be concluded the current baseline complies with all relevant mandatory national and/or sectoral policies that have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period.

However, in spite of the financial incentives given by the government to renewable power projects in India the generation from the low cost must run resources connected to the Southern Grid has not increased to such an extent that this would lead to more than 50% contribution from the low cost must run resources towards the total generation from the Southern Grid.

The approved consolidated baseline methodology, AMS-I. D. (Version 18), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "*Tool to calculate the emission factor for an electricity system*" *(version 07.0)* has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

As per CEA database version 15, the fossil fuel dominated electricity is more than renewable sector and is continuing with same pattern. In light of the above discussion it is to be concluded that in accordance with relevant guidelines stipulated in the Project Standard version 02.0, national and/or sectoral policies and circumstances had been considered towards formulating the OM & BM baseline scenario .Hence the baseline scenario as applied for the present project activity remains justified.

As per the approved consolidated methodology AMS-I. D Version 18

If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "TOOL07: Tool to calculate the emission factor for an electricity system".

The project activity involved setting up of biomass based power generation plant to harness the chemical energy of biomass to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the state grid (part of Indian grid), which is fed mainly by fossil fuel fired plants.

[17] http://www.cercind.gov.in/Act-with-amendment.pdf

In the absence of the project activity, the equivalent amount of power would have been drawn from the state grid. Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source (where available) and made publically available. The CEA database version 15 is the latest available data at the time of PD submission to DOE for validation, hence same is considered for emission factor calculations.

The combined margin of the Indian grid used for the project activity is as follows:

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9013 tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.25) & build margin (0.75) values, sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9622 tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y	Calculated as the last 3 year (2016-17, 2017-18, 2018-19) generation-weighted average, sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8811 tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y	Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India

B.5. . Demonstration of additionality

There is no direct or indirect mandate by law and the implementation of the project activity is a voluntary initiative undertaken by DDEPL. The Ministry of New and Renewable Energy (MNRE), earlier known as Ministry of Non Conventional Energy Sources (MNES)[18] also recognizes the benefits of electricity generation from biomass as a means of full exploitation of its inherent energy value. The Government of Punjab, Department of Science, Technology, Environment and Non-Conventional Energy issued a directive under Section 108 of the Electricity Act, 2003 for compliance of the New & Renewable Sources of Energy (NRSE) Policy, 2006 in its Notification No. 10/106/06-STE (1)/5390 (http://www.pserc.nic.in/pages/NRSE_orders.html) dated 24th November ,2006.This notification of NRSE Policy by the State Govt. was followed on 16.7.2007 by a Directive to the Commission under Section 108 of the Electricity Act, 2003 (Act).

[18] Now Ministry of New and Renewable Energy (MNRE)

The project activity faces the following barriers:

Investment Barrier

The project proponent was well aware of the low viability of the project activity at the time of investment decision making. However, as with another biomass based power project implemented by the project proponent, they were positive about raising additional funding through CDM to enhance its financial performance. Thus CDM revenue was taken into account which was considered the vital factor in the decision to proceed with the project activity.
Investment barrier has been demonstrated in accordance with the guidance provided by CDM EB in its 35th Meeting (Annex 34 - Non-binding best practice examples to demonstrate additionality for SSC project activities), which states under investment barrier, "*Best practice examples include but are not limited to, the application of investment comparison analysis using a relevant financial indicator, application of a benchmark analysis or a simple cost analysis (where CDM is the only revenue stream such as end-use energy efficiency)*". From the above three best practice options under Investment Barrier, the project proponent has chosen to demonstrate additionality using benchmark analysis. This analysis has been selected and conducted in accordance with the 'Guidance on the Assessment of Investment Analysis' (Version 02). For this purpose, the post-tax Project IRR has been chosen as the financial indicator and the Weighted Average Cost of Capital (WACC) as the benchmark. The suitability of this indicator and benchmark is described below.

IRR refers to the rate of return that the project is expected to generate based on the projected cash flows accruing over its expected lifespan. The IRR is the most widely used measure of investment efficiency and is one of the most commonly used financial indicators used by banks, financial institutions and project developers for measuring attractiveness of projects and for making investment decisions. The project proponent has hence identified IRR (Internal Rate of Return) as the most appropriate financial indicator for the project and carried out an investment analysis of the project activity.

The project IRR has been chosen as the appropriate indicator in light of the fact that project IRR represents the overall cost of capital employed by the project proponent. Project IRR for a project activity will need to be adequate enough to service debt as well as provide a return to shareholders i.e. it has to be worthy enough from the point of view of both investors and creditors. In assessing the viability of a project, a potential financier should theoretically only invest in the project if the IRR is greater than the weighted cost of debt and equity. In order to utilize a benchmark comparable to the project IRR, the Weighted Average Cost of Capital (WACC) has been chosen as the benchmark. This is consistent with the "Guidance on the Assessment of Investment analysis", (EB 41, Annex 45) Paragraph 11 which states "*Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR*".

As per guidance, the *financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer.* Thus, satisfying the above mentioned criteria, the project proponent has identified the *Weighted Average Cost of Capital (WACC)* as the benchmark which has been computed based on standard market parameters, also considering and incorporating the risk of the specific sector in its calculations.

Benchmark Analysis

The WACC methodology, as described below is a widely accepted method for calculating the cost of capital which is understood by both the finance community and the industry. WACC has been calculated by taking the respective proportion of debt and equity in the financing pattern as weights. The benchmark for the project has been derived based on the cost of equity financing representing the required return on capital by investors and the cost of debt financing representing required rate of return on capital by the creditors as illustrated below:

WACC = [*D* /(*D* + *E*)] X [*Cost of Debt*] X [1-*Tc* /100] + [*E* /(*D* + *E*)] X [*Cost of Equity*]

Where,

D	=	Debt component of total investment
E	=	Equity component of total investment
T_c	=	Corporate tax rate

In computing the WACC, of the examples suggested by the additionality tool, the project proponent has identified the *Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type* [paragraph 6(a) of sub-step 2b)] as the **benchmark for cost of equity**. The **benchmark for cost of debt** has been taken as the *Prime lending rate* prevailing at the time of investment decision in accordance with "Guidance on the Assessment of Investment analysis", (EB 41). The same has been adjusted to tax rate in order to serve as a benchmark comparable to post tax IRR computations.

"Guidance on the Assessment of Investment Analysis" (EB 41, Annex 45), paragraph 12, states, "*In the cases of projects which could be developed by an entity other than the project participant, the benchmark should be based on publicly available data sources which can be clearly validated by the DOE. Such data sources may include local lending and borrowing rates, equity indices, or benchmarks determined by relevant national authorities".* In accordance with this guidance, the benchmark WACC has been calculated taking values from publically available data sources, namely the websites of Reserve Bank of India, BSE Sensex of India and Bloomberg. Cost of equity has been calculated based on historical market returns of BSE Sensex, Beta values for the sector have been referred from Bloomberg, and Interest Rates on Central and State Government Dated Securities have been referred from Reserve bank of India records. Cost of debt has been taken as the Prime Lending rate prevailing at the time of investment decision making as quoted by RBI. Thus, all the data sources utilized for benchmark computation are publically available and can easily be validated by the DOE.

Post-tax Project IRR has been chosen as guided by "Guidance on the Assessment of Investment analysis", (EB 41) Paragraph 5, which says '*Taxation should only be included as an expense in the IRR/NPV calculation in cases where the benchmark or other comparator is intended for post-tax comparisons*' In this case, the WACC calculated is intended for post-tax comparison as it incorporates and considers tax shield associated with debt in its calculations. Since the interest payable on a company's outstanding debt facility can be offset against its taxable income, the after-tax cost of debt has therefore been calculated. That is, the cost of debt has been reduced by the value of the tax credits that are associated with the deductibility of the interest accruing due to the outstanding debt balance.

Cost of equity

"Guidance on the Assessment of Investment Analysis" (EB 41, Annex 45) states, paragraph 13, states "*Internal company benchmarks/expected returns (including those used as the expected return on equity in the calculation of a weighted average cost of capital - WACC), should only be applied in cases where there is only one possible project developer and should be demonstrated to have been used for similar projects with similar risks, developed by the same company or, if the company is brand new, would have been used for similar projects in the same sector in the country/region."* As the project activity could have been implemented by more than one project developer, in accordance with this guidance, expected rate of return on equity for the calculation of WACC **has not been taken** as an internal company benchmark, instead, it has been calculated based on standard market parameters considering the specific characters of the project type (using Capital Asset Pricing Model).

The Capital Asset Pricing Model (CAPM) approach having a clear theoretical foundation is a widely used methodology for determining the cost of equity and has come to dominate modern financial theory[19]. It asserts that the required rate of return on a risky asset is a function of the risk free rate of return (*Rf*) plus a risk premium that reflects the return on a well-diversified portfolio of risky assets over the risk free rate (*Rm – Rf*), scaled by the "beta" of the risky asset which is a measure of the systematic risk of the risky asset relative to the market risk as shown below.

$K_e = R_f + B \text{ X } (R_m - R_f)$

Where:

Ke = Rate of return on equity capital
Rf = Risk-free rate of return
B = Beta
Rm-Rf = Market risk premium

The risk-free rate is the interest rate that is assumed can be obtained by investing in financial instruments with no default risk. The volume weighted average yield on central Government Securities has been taken to represent the risk free return. The risk free rate of return for the year 2006-2007 has been considered and is taken as 7.89%.

Stock Index (BSE Sensex) has been used to represent the market return. The BSE SENSEX (SENSitiveindEX), also called the "BSE 30", is a widely used market index in India and Asia. It consists of the largest and most actively traded stocks, representative of various sectors, on the Bombay Stock Exchange. The Bombay Stock Exchange (BSE) authorities review and modify its composition to make sure it reflects current market conditions. Prior to investment decision, the historical returns generated by BSE Sensex were studied and found to yield a return of 19.01%.

"Guidance on the Assessment of Investment Analysis" (EB41, Annex 45, paragraph 14, states, "*Risk premiums applied in the determination of required returns on equity shall reflect the risk profile of the project activity being assessed, established according to national/international accounting principles. It is not considered reasonable to apply the rate general stock market returns as a risk premium for project activities that face a different risk profile than an investment in such indices*". In line with this guidance, general stock market returns have not been taken as a risk premium for the project activity as the risk profile of the project activity being assessed is different from the risk of the market portfolio represented by stock market indices. In order to incorporate the risk of the project activity sector in the calculation of risk premium, Beta (B) value appropriate to the project activity has been chosen as described below. This beta, by accounting for the systematic risk by quantifying the sensitivity of the stocks of the companies representing a particular project type/sector with the market portfolio, incorporates the risk of a specific sector in the calculation of the risk premium.

Beta describes how the expected return of a stock is correlated to the return of the financial market and reflects the sensitivity of the company to market risk factors. For companies that are not listed, beta values of publically traded firms whose operations and risk profiles are as similar as possible to the project activity can be considered and used as a measure of the project activity's systematic risk. Therefore, beta values of the listed private companies engaged in similar business as the project activity (i.e. the power sector) at the start of the project activity estimated by regressing weekly returns on stock against local index, using 5 years of data if available, or otherwise the data since incorporation of the company have been utilized. The group of companies considered for determination of beta includes renewable as well as conventional power generating companies. From the perspective of a private investor, investments in thermal power plants are a safer option owing to easy availability of conventional fuel, experience in technology, ease of expansion of

[19] http://www.investopedia.com/articles/06/CAPM.asp?viewed=1

generating capacity, assured return on investment, and easy availability of finances. A study of the baseline scenario, indicating that over 79% of the power generation in the country is from non-renewable sources excluding nuclear energy[20], also reinforces the fact that generation from non-renewable sources provides a more attractive and assured source of return as compared to investments in renewable energy sources. Hence it is assumed that such private companies with significant investments in non-renewable energy projects face lower risk as compared to renewable energy based power projects and hence the value of beta for such companies should also be lower. Thus, as the use of the beta value for companies with significant investment in non-renewable power projects is representative of the returns generated in the baseline scenario and is also conservative, inclusion of the same has been considered appropriate for the analysis. The Beta for the project is arrived at by calculating the weighted average of these beta's based on each company's market capitalisation (market capitalisation represents the public opinion of a company's net worth). The beta so arrived works out to be 1.18.

Cost of Debt

Cost of debt is defined as the rate at which lender's agree to lend money to a project. The 'Guidance on the Assessment of Investment Analysis' clarifies that, '*In the cases of projects which could be developed by an entity other than the project participant, the benchmark should be based on publicly available data sources which can be clearly validated by the DOE. Such data sources may include local lending and borrowing rates, equity indices, or benchmarks determined by relevant national authorities.'*

Accordingly, the Prime Lending Rate (PLR) quoted by the RBI at the time of decision making is identified as the appropriate yardstick. The PLR was found to range between 12.25-12.5%[21] and the average of this range (12.38%) has been taken as the cost of debt, while computing the WACC. In order to keep this value conservative, no risk premium associated with the project type or the project developer has been added to it. Further, RBI's PLR is in itself conservative as it does not take into account the commercial lending rates of private sector banks which are typically higher than that of nationalized banks.

Weighted Average Cost of Capital (WACC)

The benchmark rate of return (WACC) for the project activity thus works out to be 13.52 % which is the minimum rate of return the project can be expected to generate to be seen as an attractive investment opportunity.

IRR Analysis

The IRR analysis has been carried out in accordance with the "Guidance on the Assessment of Investment Analysis" (EB 41, Annex 45) Paragraph 3, which states that for carrying out IRR analysis, *"Both project IRR and equity IRR calculations shall as a preference reflect the period of expected operation of the underlying project activity (technical lifetime), or - if a shorter period is chosen - include the fair value of the project activity assets at the end of the assessment period. In general a minimum period of 10 years and a maximum of 20 years will be appropriate.".* The project IRR without CDM revenue has thus been computed for a period of 10 years with inclusion of fair value of its assets (salvage value) at the end of the assessment period based on the following assumptions:

Assumption	Value	Reference
Debt (% of total project cost)	75.00%	Detailed Project Report

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

[21] http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/76620.pdf

Loan repayment (years)	7	Detailed Project Report
Interest rate (% pa)	12.75%	Detailed Project Report
Tax depreciation (% pa) - Building - Plant & Machinery	 10% 80%	http://law.incometaxindia.gov.in/TaxmannDit/DispCitation/ShowCit.aspx?fn=http://law.incometaxindia.gov.in/DitTaxmann/IncomeTaxRules/Rules2007/appl
Book depreciation (% pa) - Building - Plant & Machinery	3.34% 5.28%	http://www.mmehtaco.com/Depreciation%20Rates%20Companies%20Act.pdf
Tax rate (%)	33.66%	http://www.taxmann.com/DitTaxmann/IncomeTaxActs/2007ITAct/gr.htm
MAT rate (%)	11.22%	http://law.incometaxindia.gov.in/DitTaxmann/IncomeTaxActs/2007ITAct/section115jb.htm
Tax Holiday	10 years	http://law.incometaxindia.gov.in/DitTaxmann/IncomeTaxActs/2005ITAct/section80IA.htm
Total Project Cost	Rs. 3564.47 lakhs	Detailed Project Report
Equity	Rs 891.12 lakhs	Detailed Project Report
Debt	Rs 2673.35 lakhs	Detailed Project Report
Capacity of the plant (kW)	8000	Detailed Project Report, Purchase Orders
Plant Load Factor - First Year - Second Year - Third Year onwards	 80% 85% 90%	Detailed Project Report in accordance with "Guidelines for the reporting and Validation of Plant Load Factors", Version 01 (EB48, Annex 11) [As explained below]
Auxiliary Consumption	11%	The DPR assumed an auxiliary consumption figure of 12%. However, to ensure conservativeness in IRR calculations, the same has been kept as 11%[22]
Net Generation (kWh) - First Year - Second Year - Third Year onwards	 47,162,880 50,110,560 53,058,240	Ex-ante estimate calculated on the basis of parameters stated above
Power Purchase Tariff (Rs/kWh) - First Year	 Rs. 3.85 Rs. 4.04 Rs. 4.24	Punjab State Electricity Regulatory Commission Order Dated 13/12/2007 (http://www.pserc.nic.in/pages/NRSE_orders.html)

[22] Based on publically available data of similar biomass based power plants under operation in the host country

- Second Year - Third Year - Fourth Year onward	Rs. 4.45	

In compliance with the 'Guidance on the Assessment of Investment Analysis' (EB 41), Paragraph 6, which clarifies that '*Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant'*, assumptions adopted for the IRR analysis have been sourced from the DPR prepared during project inception by a reputed independent engineering consultancy 'Pranam Consultants' as envisaged at the time of investment decision making. The DPR has been duly approved by Punjab Energy Development Agency (PEDA) which is the nodal agency for promotion and development of non-conventional and renewable energy programs or projects in the State of Punjab. In accordance with "Guidelines for the reporting and Validation of Plant Load Factors", Version 01 (EB48, Annex 11), the Plant Load Factor (PLF) has been defined ex-ante in the PDD according to option II (a), stating, 'The plant load factor provided to the government while applying the project activity for implementation approval'. The PLF has thus been sourced from the Detailed Project Report (DPR) which as mentioned, was approved by the state nodal agency for promotion and development of nonconventional and renewable energy - PEDA. PEDA granted implementation approval for the project on the basis of this DPR. All other input figures (tariff, tax, depreciation etc.) have been sourced from publically available sources providing values which were valid and applicable at the time of investment decision.

Using the assumptions in the table above, the post-tax project IRR for the project activity works out to be **8.00% (7.999%)** which is considerably lower than the benchmark rate of **13.52%** adopted by the project. This clearly demonstrates that the project activity is not very attractive as an investment option as the Project IRR is even lower than the benchmark (WACC) adopted which is the bare minimum rate of return a project is expected to generate to merit consideration by the applicable investor groups. Thus, the project proponent is seeking CDM funding for the project to improve the viability of the project activity and justify investment in such an initiative.

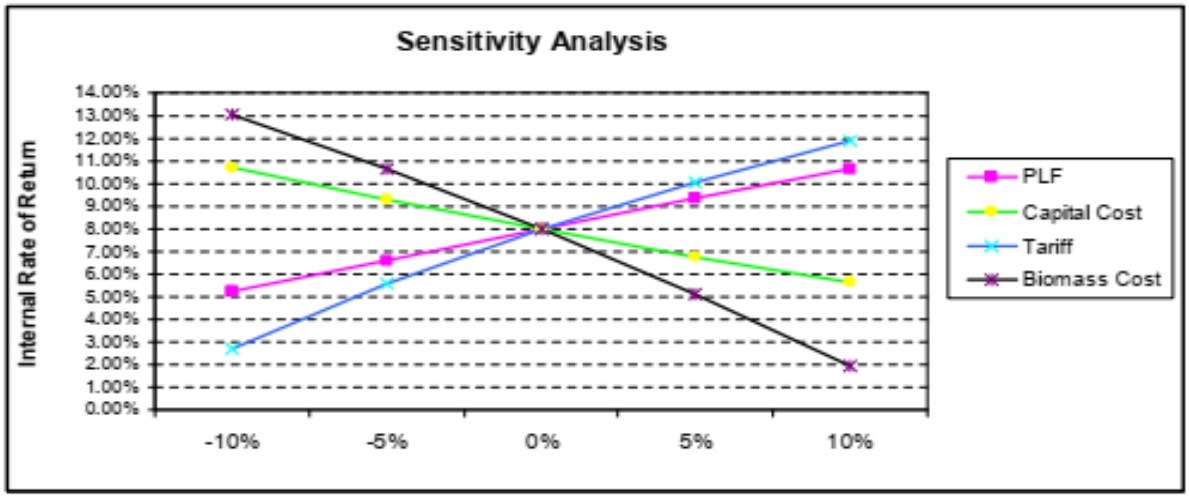
Sensitivity analysis

In order to ascertain the magnitude of risk associated with the project activity a sensitivity analysis has been carried out, by varying the critical parameters of the project activity. In accordance with the "Guidance on Assessment of Investment Analysis" Version 02, Paragraph 16, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues have been subjected to reasonable variation. In accordance with Paragraph 17 of the same guidance, a range of +10% to -10% has been considered as the range of variation.

Base Case	8.00%				Comments
	Decrease		**Increase**		
Variable Parameter	10%	5%	5%	10%	
Biomass Price	13.05%	10.62%	5.14%	1.96%	Biomass prices unlike fossil fuel are not regulated by any agency and unexpected prices hikes are a common phenomenon primarily due to the following reasons: a) a demand is created for the surplus biomass in the region which otherwise remains unutilized. With sustained demand for biomass, the awareness amongst sellers of biomass increases about the dependence of such power plants on the biomass for their operations and b) after setting

					up of the power plant, the exit barriers for the project proponent are high and hence the biomass sellers would seek higher prices for the fuel which the project proponent will be forced to pay. c) The transportation cost (including loading and unloading cost) constitutes a significant portion of the landed cost of the biomass. For transport of biomass from various collection points as envisaged in the project activity, the cost of logistics (collection, loading, transport and unloading) increases the cost. With rising prices of oil, cost of the biomass. For transport of biomass from various collection points as envisaged in the project activity, the cost of logistics (collection, loading, transport and unloading) increases the cost. With rising prices of oil, the costs of transportation are only expected to go up in the future. Thus, a decrease in biomass price by 10% is considered a highly improbable deviation, even after which the IRR of the project remains below the benchmark.
Tariff rate	2.68%	5.61%	10.03%	11.8%	PSERC order dated 13.12.2007 states the tariff for Biomass power as Rs 3.49/unit (with base year 2006-07) with five annual escalations at 5% up to 2011-12. As mentioned in the order, enhancement of these rates in perpetuity is not justified and is against the long term interests of the consumers. Accordingly, the Commission holds that rates as prescribed in the Policy will be applicable for a period of 5 years (upto 2011-12) after which the last escalated tariff shall continue and the Commission will determine the manner in which further enhancement in tariff, if any, by way of encouragement to the sector is to be effected. However, it may be noted that enhancement in tariff by PSERC is a remote possibility as **à** The tariff rates determined by PSERC are already much higher than those determined for Punjab's neighbouring states. **à** If the project proponent approaches the commission individually for revision and escalation in tariff for the project activity, the probability of the same being granted is very low as by the end of escalation period, the project proponent would already have paid back most of its loan amount and would thus need to pay lower interest amounts to the bank. Thus, in view of the lessened financial burden on the project proponent, the commission is not likely to approve the plea for greater enhancement in tariff as an individual entity. Thus, an increase of 10% in tariff rate by the State Electricity Board is considered a highly improbable scenario.
Plant Load Factor	5.21%	6.62%	9.35%	10.66%	As a conservative measure, the Plant Load Factor for the entire span of 10 years has already

					been fixed high. Hence, any further increase in PLF is not envisaged. However, an extreme case of an increase of 10% in PLF has also been considered for the analysis, after which the IRR still remains below the benchmark.
Capital Cost	10.70%	9.30%	6.79%	5.66%	The capital cost primarily comprises of the cost of plant and machinery, land and buildings. Out of this, the cost of plant and machinery comprises of more than 60% of the total project cost. The purchase orders for plant and machinery had already been placed in advance and hence no variation in their price could be expected. Further, the cost of land and buildings is also only expected to increase due to the rising inflation in the country as well as the upward trend in prices of Iron and Steel. Thus, taking these factors into consideration, a decrease in capital cost is not envisaged.



The results of the sensitivity analysis clearly illustrate that even with variation in critical parameters of the project activity, the IRR remains lower than the benchmark rate of return (Weighted Average Cost of Capital**-13.52%**).

Further, as can be observed, the project IRR is even lower than the average Prime Lending Rate (PLR) prevailing at the time of decision making for the project activity as quoted by Reserve Bank of India. The PLR was found to range between 12.25-12.5%[23] for 5 major banks in the country at the time of decision making and the average of this range is 12.38%. The project IRR marginally crosses this figure only under a scenario of 10% reduction in the biomass prices, which is a highly improbably scenario, as explained above.

Additionally, it is to be noted that debt creditors do not view project returns merely meeting the interest rate as an adequate ground in itself to establish viability of project. From their viewpoint, a

[23] http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/76620.pdf

sufficient cushion has to be considered so as to provide a margin for adverse developments. Even if returns from a project were equal to or marginally above the lending rate, the lenders would face the risk of suffering if the project underperforms by even a small margin. In order to ensure investment in the project along with its continued operation, the expectations of debt creditors are thus well above the lending rate. However, as can be observed from the analysis above, returns from the project are so low that they do not even match up to the PLR, let alone exceed it.

The above discussion clearly demonstrates that the project activity faces investment barrier and would not have been undertaken without CDM . In the absence of the project activity, equivalent amount of electricity would have been generated in the regional electricity grid which is fossil fuel dominated which would have led to higher greenhouse gas emissions. Hence, according to attachment A of Appendix B of the simplified modalities and procedures for small scale CDM project activities, the project activity is additional.

Prevailing Practice Barrier

In the Indian Power Sector, common practice involves investing mostly in medium or large-scale fossil fuel fired power projects which generate higher emissions. This is mainly due to the assured return on investment, economies of scale and easy availability of finances. The same trend applies for the state of Punjab and the challenge lies in aligning biomass power with conventional power in terms of reliability, quality and cost. Privately financed, built and operated small biomass power plants are not common practice in Indian power sector. Furthermore, the rapid pace of industrialization in India favours huge amounts of power and necessitates the installation of large multi-purpose power projects based on fossil fuels and not small biomass based power generation projects.

The total estimated potential for biomass power/co-generation in India is 19,500 MW[24]. The existing installed biomass capacity of biomass based power/co-generation is around 1,252[25]MW which is less than 7% of the total estimated potential for biomass power in India[26].

As of date, the total installed capacity of power plants supplying to PSEB is 6,356 MW[27]. Of this, the total grid interactive biomass power installed capacity in Punjab as per latest publicly available information is 28[28] MW which is less than 0.5% of the total installed capacity of power plants supplying to PSEB. The total biomass potential identified for Punjab is 1,000 MW[29]which shows that biomass power potential is grossly underutilized and less than 3% of this potential has been harnessed so far for supply to the grid.

Thus, as elucidated by the statistics above, generation of electricity by biomass based power plants is not a common practice in the region.

Currently, there are only two other independent biomass based power producers in the state of Punjab and both are registered CDM activities[30]. One of them ran into problems and hence is now no longer operational. However, DDEPL has decided to go ahead with the implementation of the project activity taking CDM funding into consideration in spite of anticipating various barriers. Thus, this power plant will be the second biomass based power project by an independent power

[24] http://mnes.nic.in/booklets/Book2-e.pdf

[25] http://mnes.nic.in/prog-biomasspower.htm

[26] http://www.in.kpmg.com/pdf/IndiaEnergy_07.pdf

[27] http://www.psebindia.org/pseb/docs/installed_capacity__generation.htm

[28] http://mnes.nic.in/annualreport/2006_2007_English/HTML/ch3_pg5.htm

[29] http://punjabgovt.nic.in/Industry/PEDA.htm

[30] Malwa and Jalkheri

producer in the region which has been envisaged only after serious consideration of CDM funding, given the associated inherent risks which have deterred other private players from investing in similar projects in the region. This substantiates that the project activity is not the prevailing practice in the region and other similar projects have only been implemented with additional funding.

Assured supply of fuel

Biomass residues are widely dispersed in small quantities in the region and in normal practice are burnt inefficiently or left to rot in the field. Thus, collection and transportation of biomass fuels is a major constraint faced by the project proponent. Lack of proper logistics network for collection and delivery of biomass residues has discouraged its use as fuel for power generation purposes in the region. Due to its large volume, farmers do not prefer to traverse long distances (more than 5-7 km) in order to sell the biomass. Devoid of options, to ensure continuous & economical supply of fuel, the project proponent proposes to develop its own fuel collection mechanism. Under this mechanism, it would be required to set up biomass/crop residue collection centers in various villages. In this regard, advertisements will be put up in local newspapers/newsletters inviting farmers to sell their crop residues. Each collection center will be equipped with equipments like weighbridge, mobile chipping machines and transport vehicles, and would required additional land for storage of biomass residues. Despite these measures, there is no certainty that these collection centres will attract enough farmers to sell their crop residues to enable collection of the requisite amount of biomass.

As an example, previously, one other biomass based power project in the region[31] was not able to run successfully as there was no proper system of collecting the raw material and transporting it to the plant[32]. A vast distribution network was required to be established to ensure regular supply of straw for the successful operation of the plant rendering the project unfeasible. The project proponent however, has decided to implement the fuel collection mechanism in spite of the awareness and history of uncertainty attached to its success.

Further, supply of rice husk, mustard husk, wheat straw and cotton sticks which are agricultural products have other uncertainties associated with their supply due to their dependence on a variety of natural factors as with their seasonal nature. Maintaining a constant supply of biomass is dependent on numerous unpredictable parameters which decide cultivation and crop yield like monsoon, demand in the market, prices of other crops, etc. Furthermore, the biomass power plant would have to be shut down during rainy season since the fuel will be stored in open yards and will become wet rendering it unfit for combustion.

Additionally, the availability of biomass during rainy season is also reduced as rain hampers the activity of collection and transportation of biomass. All these factors are not in control of the project proponent and thus, usage of such fuels entails significant amount of risk. CDM revenues are anticipated to provide an additional cushion in the event of losses or low productivity, thus aiding in alleviating the same.

Thus it can be justifiably concluded that the project activity faces various barriers to its implementation and would not have been implemented without factoring in additional revenues from CDM.

[31] Jalkheri Biomass based power plant

[32] http://www.tribuneindia.com/2001/20010704/punjab1.htm

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

Baseline emissions calculations:

As per para 22 of AMS-I.D. (Version 18), baseline emission are calculated as follows:
$BE_y = EG_{PJ,y} \times EF_{grid,y}$
Where,
BE_y = Baseline Emissions in year y; t CO_2

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,.y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)

Calculation of $EG_{PJ,y}$
As proposed project activity is a greenfield project, in accordance with para 26 of applied methodology $EG_{PJ,y} = EG_{PJ, facility,y}$
Where,
$EG_{PJ, facility,y}$ Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

Calculation of BE_y

Calculation of baseline emissions i.e. BE_y, requires calculation of grid emission factor ($EF_{grid,y}$), which is being presented below:

As per para 23 of the applied methodology, the emission factor can be calculated in a transparent and conservative manner as follows:
(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system"; or
(b) The weighted average emissions (in tCO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The PP has chosen option a i.e. combined margin (CM) consisting of combination OM and BM. Tool to calculate the emission factor for an electricity system (Version 04.0.0), has been used to determine the CO_2 emission factor for displacement of electricity generated by power plants in an electricity system, by calculating the combined margin emission factor (CM) of that electricity system. As per the tool, PP has applied the following six steps:

Step 1: Identify the relevant electricity systems.

As described in tool "For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems". It also states that "If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used". Keeping this into consideration, 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 since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO_2 Baseline Database. As of 31 December 2013, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project

Table: Geographical Scope of Indian Electricity Grid

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar& Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	Puducherry
Rajasthan		Goa	Tripura	Lakshadweep
Uttar Pradesh				
Uttarakhand				

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)

India	2014-15	2015-16	2016-17	2017-18	2018-19
	16.8%	15.1%	14.6%	14.3%	14.5%

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 CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

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 PD 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 ($EF_{grid,OMsimple,y}$) 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)			
	2016-17	2017-18	2018-19
INDIAN Grid	916,278	960,693	999,957

Simple Operating Margin (tCO_2/MWh) (incl. Imports)			
	2016-17	2017-18	2018-19
INDIAN Grid	0.9636	0.9543	0.9685

Weighted Generation Operating Margin	
INDIAN Grid	**0.9622**

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 07.0, EB 100, Annex 4) para 72:

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 PD 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 PD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
	2018-19
INDIAN Grid	**0.8811**

Step 6: Calculate the combined margin (CM) emission factor ($EF_{grid,CM,y}$)

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 81:

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 CO_2 emission factor in year y (t CO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (t CO_2/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}:

In particular, for biomass generation types such as, the 'Tool to calculate the emission factor for an electricity system (Version 04.0.0)', allows to weigh the operating margin and Build margin at 50% and 50%, respectively.

$EF_{grid, CM, y} = EF_{grid, OM, y} * 0.25 + EF_{grid, BM, y} * 0.75 = 0.9622* 0.25 + 0.8811 *0.75 = 0.9013$ tCO_2/MWh

Hence, $EF_{grid, y} = EF_{grid, CM, y} = 0.9013$ tCO_2/MWh

Project emissions calculations:
Greenhouse gas emission due to the combustion of biomass is neutralized by the sequestration that took place during the growth cycle of the biomass crop. Thus, CO2 emission during combustion of biomass is not considered. Also, the crop residues that the project activity intends to utilize contains negligible quantities of nitrogen and sulphur and thus, emission of other greenhouse gases can be considered negligible. Hence, within the project boundary, no GHG emissions would be generated due to the project activity.

Further, it is to be noted that if in case of exigencies, fossil fuel (e.g. coal) is utilized in the project activity the project emissions from the same will be accounted for as follows:

As per para 39 of applied methodology AMS I.D version 18, the proposed project is not a geothermal project neither it involves any reservoir, hence project emission considered on account of that is considered as zero.

In accordance with para 40 of applied methodology, CO2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

The proposed project activity envisages the use of Coal along with biomass for the electricity generation. Therefore, the project emission arising due to use of coal is calculated as mentioned below:

$$PE_y = \sum_i FC_{I,j,y} X\ COEF_{i,y}$$

Where:
$PE_{FC,j,y}$ = Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)

$FC_{i,j,y}$ = Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

i = Are the fuel types combusted in process j during the year y

As per para 7 of "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" version 03.0, there are two options to calculate CO_2 emission coefficient ; here option (b) is followed.

In this option, the CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO2 emission factor of the fuel type i, as follows:
$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$

Where:
$NCV_{i,y}$ = 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 (tCO_2/GJ)

i = Are the fuel types combusted in process j during the year y

As per the methodology AMS-I.D. version 18.0, in addition to fossil fuel consumption, there may be cases of project emissions in biomass projects and that is calculated by the tool "Project and leakage emissions from biomass" version 04.0; it may happen in two instances - project emissions resulting from cultivation of biomass in a dedicated plantation and project emissions resulting from utilization of biomass residues. The proposed project activity will use biomass residues i.e. agricultural residues which are procured by the project proponent.

Project emissions resulting from utilization of biomass residues are estimated as follows: $PE_{BU,y} = PE_{EC,y} + PE_{TR,y}$

Where:
$PE_{BU,y}$ = Emissions resulting from utilization of biomass residues, in year y (t CO_2e)
$PE_{EC,y}$ = Emissions resulting from energy consumption, in year y (t CO_2e)
$PE_{TR,y}$ = Emissions resulting from transport of biomass, in year y (t CO_2e)

For small-scale project activities where transportation distance of biomass is less than 200 km. both these emissions are ignored. Hence, in this project activity, project emissions from biomass are negligible.

Leakage emissions
As stated in paragraph 12 of Type I category D of indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activities (version 13-EB 36), if energy generating equipment is transferred from another activity of if the existing equipment is transferred to another activity, leakage is to be considered.

Since there has been no transfer of equipment from another activity to the proposed project activity, nor has the existing equipment been transferred to another activity, no leakage estimation is required.
However, the only source of GHG emissions which are attributable to the project activity lying outside the project boundary will be the emissions generated during the transportation of biomass (which would also not be very significant as biomass is abundantly available in the nearby vicinity, thereby not much transportation distance of biomass is involved in the project activity). The same have been estimated below:

Emissions due to the transportation of Biomass

Yearly biomass requirement of project activity	77,567	Tonnes/year
Biomass transported by truck	77,567	Tonnes/year
Biomass load per truck	8	Tonnes
Total number of Trips	9,696	-
Max distance between the Project site and collection centres	50	Km
Consumption of diesel per trip (to and fro @ 4 km/ litre)	25	Litre

Total Diesel Consumption	242,397	Litre
Calorific Value of Diesel	2.83 x 10-5	TJ/Litre
Emission Factor for Diesel	74.1*	tCO2/TJ
Total Emissions due to transportation of Biomass	508	tCO2

* Effective CO_2 Emission Factor of Diesel Oil according to 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Similar quantum of emissions would have occurred in the baseline as well, due to the transport of coal for the grid connected power plants and FO for the onsite DG sets. Also, as per attachment C to appendix B of Indicative simplified baseline and monitoring methodology for selected small-scale CDM project activity categories (Point No.12, Page-3), as this emission source is likely to be smaller than 10%, it can be neglected in the context of SSC project activities.

According to attachment C to appendix B of Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories –"General guidance on leakage in biomass project activities" Version 2, for small scale activities involving renewable biomass, there are three types of sources that are potentially significant (>10% of emission reductions) and attributable to the project activities. These emission sources may be project emissions (if under the control of project participants, i.e. if the land area where the biomass is grown is included in the project boundary) or sources of leakage (if the source is not under control of project participants). The following table summarizes, for different types of biomass, the cases where the emission source is relevant and the cases where it is not.

Biomass type	**Activity / source**	**Shift of pre project activities**	**Emissions from biomass generation /cultivation**	**Competing use of biomass**
Biomass from forests	Existing forests	-	-	X
New forests	X	X	-	
Biomass from croplands or grasslands (woody or non woody)	In the absence of the project the land would be used as cropland / wetland	X	X	-
	In the absence of the project the land would be abandoned	-	X	-
Biomass residues or wastes	Biomass residues or wastes are collected and used	-	-	X

For the project activity utilizing biomass wastes/residues, the only identified source of leakage is that which is arising from competing use of biomass. The biomass may in the absence of the project activity be used elsewhere, for the same or a different purpose. As stated in indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activities (version 13-EB 36) Type I category D (page 8), four approaches can be used to demonstrate that the biomass residues used in the plant will not increase fossil fuel consumption or other GHG emissions elsewhere i.e. L1, L2, L3 & L4. Where scenarios B1, B2 or B3 apply, approaches L1, L2 or L3 may be used. The biomass utilized in the project activity, in its absence would have either been dumped or left to decay under mainly aerobic conditions or burnt in an uncontrolled manner without utilizing it for energy purposes i.e. scenario B1 & B3. Thus, L2 approach has been adopted

at present to rule out leakage for this project activity by demonstrating that there is an abundant surplus of biomass in the region of the project activity which is not utilized. For this purpose, as required, it has been demonstrated that the quantity of available biomass residues likely to be used in the project activity in the region is at least 25% larger than the quantity of biomass residues that are utilized including the project plant.

This has been evaluated in the Biomass Assessment Study (BAS) carried out as a part of the Detailed Project Report by MCJ Energy Engineers Pvt. Ltd. which was duly approved by Punjab Energy Development Agency (PEDA). For the proposed power plant of 8 MW capacity, 77,567 tonnes of biomass is the annual requirement. The BAS details the generation and availability of biomass residues proposed to be utilised in the project activity as follows:

Crop	Generation (MT)	Consumption (MT)			Surplus (MT)	Surplus as % of Consumption
		Region	Project Activity	Total		
Paddy Straw	730,945	511,662	63959	575621	155,324	26.98%
Paddy Husk	90,401	764	6006	6770	83,631	1234.87%
Bagasse	364,598	106,961	7602	114,563	250,035	218.25%

The above table substantiates that the biomass residue types proposed to be utilised in the proposed project activity are available in surplus in the region since their surplus availability is much more than the stipulated cap of 25%.

In accordance with Attachment C to Appendix B of “Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories”- “General guidance on leakage in biomass project activities”, Version 03 (Paragraph 18),, to evaluate if there is abundance and surplus of biomass in the region, a biomass assessment study will be carried out at the beginning of every crediting period in the absence of published literature/official reports/surveys. In accordance with the guidance, if the biomass assessment study demonstrates that the quantity of available biomass in the region is at least 25% larger than the quantity of biomass that is utilized including the project activity, then this source of leakage will be neglected. Otherwise the leakage shall be estimated and deducted from the emission reductions.

In case in the future, leakage effects cannot be ruled out for a certain biomass residue used in the project activity with one of the approaches provided in indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activities (version 13-EB 36) Type I category D (page 8), leakage effect for that year will be calculated as follows:

Where,

$$LE_y = EF_{CO2,LE} \cdot \sum_n BF_{LE,n,y} \cdot NCV_n$$

LEy = Leakage emissions during year y (tCO2/yr)
EFCO2,LE = CO2 emission factor of the most carbon intensive fuel used in the country (tCO2/GJ)
BFLE,n,y = Quantity of biomass residue type *n* used for heat generation as a result of the project activity during the year *y* for which leakage cannot be ruled out using one of the approaches L1,L2,L3 or L4 (tons of dry matter or litre)
NCVn = Net calorific value of the biomass residue type *n* (GJ/ton of dry matter or GJ/litre)
n = Biomass residue type n for which leakage cannot be ruled out using of the approaches L1,L2,L3 or L4

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,OM}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor for Indian grid (weighted average of 3 years 2016-17, 2017-18 and 2018-19
Source of data	Calculated from CEA CO_2 Baseline Database Version 15.0[33] December 2019
Value(s) applied	0.9622
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07" as 3-year generation weighted average using data for the years 2016-17, 2017-18 and 2018-19 The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 15[34], December 2019, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	To calculate baseline emissions
Additional comment	This value has been fixed ex ante for emission reduction calculations.

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2 /MWh
Description	Build margin for calculation of grid emission factor for INDIAN grid
Source of data	Calculated from CEA database, Version 15[35], Dec 2019
Value(s) applied	0.8811
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07" as per the latest data available for the most recent year 2018-19. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 15[36], published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	To calculate baseline emissions
Additional comment	This value has been fixed ex ante for emission reduction calculations

[33] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

[34] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

[35] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

[36] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO2/MWh
Description	Combined Margin Grid emission factor for INDIAN Grid
Source of data	Calculated from CEA database, Version 15, Dec 2019[37]
Value(s) applied	0.9013
Choice of data or measurement methods and procedures	The combined margin emissions factor is calculated as follows: $\mathbf{EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}}$ Where: $EF_{grid,BM,y}$= Build margin CO_2 emission factor in year *y* (tCO_2/MWh) $EF_{grid,OM,y}$= Operating margin CO_2 emission factor in year *y* (tCO_2/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 25% W_{BM}= Weighting of build margin emissions factor (%) = 75%
Purpose of data	To calculate baseline emissions
Additional comment	This value has been fixed ex ante for emission reduction calculations.

Data/Parameter	$SFC_{Biomass}$
Data unit	kg/kWh
Description	Specific fuel consumption of biomass fuel types envisaged to be utilized in the project activity
Source of data	Specific fuel consumption has been calculated as:- SFC= SHR/ GCV
Value(s) applied	**Type of biomass** / **Symbol** / **GCV (kcal/kg)** / **SFC (kg/kWh)** Paddy Straw / SFC_{PS} / 3400 / 1.24 Paddy Husk / SFC_{PH} / 3200 / 1.31 Bagasse / SFC_{BG} / 4500 / 0.93
Choice of data or measurement methods and procedures	The station heat rate (SHR) of the plant (4200 kcal/kWh) and the GCV values of the fuel types envisaged to be used in the project activity have been sourced from the Detailed Project report. At inception, the project proponent envisaged the utilization of the above mentioned biomass fuel types in the project activity. However, based on surplus availability, other biomass types may also be used during operation. Specific fuel consumption of the biomass types utilized will be similarly determined based on the SHR (4200 kcal/kWh) and the GCV of the fuel used.
Purpose of data	To calculate baseline emissions
Additional comment	This value has been fixed ex ante for emission reduction calculations.

[37] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

Data/Parameter	SF_{CFF}
Data unit	Kg/kWh
Description	Specific fuel consumption of fossil fuel (e.g. coal) used in the project activity during exigencies
Source of data	Specific fuel consumption has been calculated as:- **SFC** = **SHR/ GCV**
Value(s) applied	1.119 (coal)
Choice of data or measurement methods and procedures	The GCV of coal sourced from CEA CO2 baseline database and is taken as 3755 kcal/kg and the SHR sourced from the Detailed Project Report has been taken as 200 kcal/kWh.
Purpose of data	To calculate baseline emissions
Additional comment	This value has been fixed ex ante for emission reduction calculations

B.6.3. Ex ante calculation of emission reductions

Baseline Emissions

Plant Capacity	MW	8.0[38]
Plant Load Factor	%	90%
Number of days of operation in a year	Days	345[39]
Number of hours of operation in a day	Hours	24
Number of hours of operation per year	Hours	8280
Auxiliary consumption	%	11
Baseline emission factor (Combined Margin)	tCO_2/MWh	0.9013

Baseline emissions (BE_y)= $EG_{PJ,y} \times EF_{grid,y}$

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)

BE_y = 53,058.24*0.9013 = 47,821 tCO_2e

Project Emissions

Fossil fuels are not envisaged to be used in the project activity. Hence, project emissions from fossil fuel have been calculated as nil for ex-ante calculations. However, in case of exigencies, if any fossil fuel (e.g. coal) is used then project emissions from the same will be accounted for as described in section B.6.1. Further, this being a small-scale project, there are no emissions from biomass as well. Hence, total project emissions PE_y = 0 tCO_2e

Leakage

[38] The actual plant capacity may vary by up to ± 5% compared to design capacity

[39] The actual number of days for which the plant is operational may vary

As demonstrated in section B.6.1, there is no leakage associated with this project activity at present. Hence leakage emissions $LE_y = 0\ tCO_2e$

Emission Reductions:

$ER_y = BE_y - (PE_y + LE_y) = 47,821 – 0 = 47,821\ tCO_2$

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)
2017-18	47,821	0	0	47,821
2018-19	47,821	0	0	47,821
2019-20	47,821	0	0	47,821
2020-21	47,821	0	0	47,821
2021-22	47,821	0	0	47,821
2022-23	47,821	0	0	47,821
2023-24	47,821	0	0	47,821
Total	334,747	0	0	334.747
Total number of crediting years	7			
Annual average over the crediting period	47,821	0	0	47,821

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{export,y}$
Data unit	kWh
Description	Electricity exported by DDEPL
Source of data	Records of monthly joint meter readings
Value(s) applied	53,058,240
Measurement methods and procedures	This will be recorded every month jointly by representative officials of DDEPL and the grid/licensee and will be archived and stored by both parties. Monitoring will be carried out on the main meter installed at the interconnection point.
Monitoring frequency	Continuous Monitoring, Continuous Measurement and at least monthly recording
QA/QC procedures	In case the main meter becomes defective, the readings would be based on readings recorded on the check meter located near the substation. The accuracy class of these meters would be Class 0.2. Calibration of these meters from a recognized testing house/laboratory would be carried out annually.
Purpose of data	To calculate baseline emissions
Additional comment	The archived data will be kept for 2 years beyond the Crediting Period (CP)

Data/Parameter	$EG_{import,y}$
Data unit	kWh
Description	Electricity imported by DDEPL
Source of data	Records of monthly joint meter readings

Value(s) applied	0
Measurement methods and procedures	This will be recorded every month jointly by representative officials of DDEPL and the grid/licensee and will be archived and stored by both parties. Monitoring will be carried out on the main meter installed at the interconnection point.
Monitoring frequency	Continuous Monitoring, Continuous Measurement and at least monthly recording
QA/QC procedures	In case the main meter becomes defective, the readings would be based on readings recorded on the check meter located near the substation. The accuracy class of meters would be Class 0.2. Calibration of the meter from a recognized testing house/laboratory would be carried out annually
Purpose of data	To calculate baseline emissions
Additional comment	The archived data will be kept for 2 years beyond the Crediting Period (CP)

Data/Parameter	$EG_{net,y}$
Data unit	kWh/year
Description	Net electricity exported by DDEPL
Source of data	Records of monthly joint meter readings
Value(s) applied	53,058,240
Measurement methods and procedures	This will be calculated as the difference of the electricity exported and the electricity imported as monitored above. It would be based on the joint recordings by representative officials of DDEPL and the grid/licensee. This is the major parameter for calculation of emission reductions and will be based on readings of the main or check meter installed at the interconnection point
Monitoring frequency	Continuous Monitoring, Continuous Measurement and at least monthly recording
QA/QC procedures	Since this is a calculated parameter, no QA/QC procedures are to be applied.
Purpose of data	To calculate baseline emissions
Additional comment	The archived data will be kept for 2 years beyond the Crediting Period (CP)

Data/Parameter	$EG_{gross,y}$
Data unit	kWh
Description	Gross electricity generated by the biomass power plant.
Source of data	Electronic Power and Energy meter, Daily log books
Value(s) applied	59,616,000
Measurement methods and procedures	For cross checking purposes, gross electricity generated will be measured in the plant premises and monitored and recorded every shift (8 hours).
Monitoring frequency	Daily monitoring and monthly recording
QA/QC procedures	The accuracy class of meters would be Class 0.5. Calibration of the meters from external recognized agencies would be carried out annually
Purpose of data	To calculate baseline emissions
Additional comment	The archived data will be kept for 2 years beyond the Crediting Period.

Data/Parameter	$EG_{aux,y}$
Data unit	kWh/year
Description	Power consumed by the power plant and its auxiliaries
Source of data	Electronic meter, Daily log books
Value(s) applied	6,557,760
Measurement methods and procedures	For cross checking purposes, auxiliary electricity consumed will be measured in the plant premises and monitored and recorded daily.
Monitoring frequency	Daily monitoring and monthly recording

QA/QC procedures	The accuracy class of meters would be Class 0.5. Calibration of the meters from external recognized agencies would be carried out annually.
Purpose of data	To calculate baseline emissions
Additional comment	The archived data will be kept for 2 years beyond the Crediting Period.

Data/Parameter	$FC_{biomass,i,y}$
Data unit	tonnes
Description	Quantity of biomass fuel used to generate electricity
Source of data	Plant log books
Value(s) applied	**Biomass type** / **Symbol** / **Quantity**: Paddy Straw / $FC_{PS,y}$ / 63,959; Paddy Husk / $FC_{PH,y}$ / 6006; Bagasse / $FC_{BS,y}$ / 7602
Measurement methods and procedures	Quantity of fuel used in the power plant will be measured electronically using a load cell installed on the conveyor belt prior to feeding into the boiler.
Monitoring frequency	Daily monitoring and daily recording
QA/QC procedures	The data will be recorded for further verification with the amount of biomass mentioned in invoices / receipts from fuel contractors; besides the load cell used for weighing biomass will be calibrated once in a year
Purpose of data	To calculate baseline emissions
Additional comment	Crediting Period (CP)+2 years

Data/Parameter	$FC_{FF,y}$
Data unit	tonnes
Description	Quantity of fossil fuels (e.g. coal) consumed in the project activity in year y
Source of data	Plant log books
Value(s) applied	0
Measurement methods and procedures	Quantity of fossil fuel used in the power plant will be measured electronically using a load cell installed on the conveyor belt prior to feeding into the boiler.
Monitoring frequency	Daily monitoring and daily recording
QA/QC procedures	The data will be recorded for further verification with the amount of fossil fuel mentioned in invoices / receipts from fuel contractors; besides the load cell used for weighing biomass will be calibrated once in a year
Purpose of data	To calculate project emissions
Additional comment	The data will be recorded for further verification with the amount of fossil fuel mentioned in invoices / receipts from fuel contractors.

Data/Parameter	$NCV_{Biomass}$
Data unit	kcal/kg
Description	The calorific value of biomass used to generate electricity:- NCV_{PS} NCV_{PH} NCV_{BS}
Source of data	Test reports
Value(s) applied	--[40]

[40] This value will be determined during verification if any fossil fuel used during the period

Measurement methods and procedures	Biomass samples will be tested by an external certified agency annually. Further, as and when biomass is received at site, the calorific value shall also be obtained through sample testing using bomb calorimeter available at site. The properties of biomass from ultimate analysis – calorific value; ash compositions etc. are consistent in the region.
Monitoring frequency	Recording frequency: Annually A sample from the biomass received at plant is taken and tested using a bomb calorimeter for its calorific value before being used in the boiler. Results for all calorific value tests are maintained in a log book.
QA/QC procedures	Though , the calorific value of the biomass is fairly constant the bomb calorimeter will be calibrated once in a year
Purpose of data	To calculate baseline emissions
Additional comment	Crediting Period (CP)+2 years

Data/Parameter	$NCV_{FF,y}$
Data unit	kcal/kg
Description	The calorific value of fossil fuel (e.g. coal) used in the project activity in year y
Source of data	Test reports
Value(s) applied	---[41]
Measurement methods and procedures	Samples of the fossil fuel used in the project activity will be tested by an external certified agency annually. .
Monitoring frequency	Recording frequency: Annually
QA/QC procedures	Testing of fossil fuel samples will be carried out by external certified agencies.
Purpose of data	To calculate project emissions
Additional comment	Crediting Period (CP)+2 years

Data/Parameter	$EF_{CO2,y}$
Data unit	tCO_2/GJ
Description	CO_2 emission factor of fossil fuel (e.g. coal) in year y (tCO_2/GJ)
Source of data	Appendix B , Baseline Carbon Dioxide Emission Database, version 15.0, given by Central Electricity Authority (CEA), December 2019[42]
Value(s) applied	0.0958 (coal)
Measurement methods and procedures	The emission factor will be sourced from the Baseline Carbon Dioxide Emission Database, version 15.0 that has been prepared by CEA which is a statutory organisation under Ministry of Power, India that collects and records the data concerning the generation, transmission, trading, distribution and utilization of electricity. In case a particular fossil fuel is used whose emission factor is not available in the CEA database, then the IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories shall be used.
Monitoring frequency	Revision of value as per latest version of CEA CO_2 database
QA/QC procedures	This parameter is directly sourced from official data (CEA CO_2 baseline database
Purpose of data	To calculate project emissions

[41] This value will be determined during verification if any fossil fuel used during the period

[42] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

Additional comment	Crediting Period (CP)+2 years

Data/Parameter	Demonstration of Surplus biomass
Data unit	Tonnes
Description	Surplus biomass in the region
Source of data	Biomass assessment study/published literature/official reports/surveys
Value(s) applied	643,255
Measurement methods and procedures	Biomass surplus will be demonstrated at the beginning of each crediting period in accordance with Attachment C to Appendix B of "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories"- "General guidance on leakage in biomass project activities", Version 03 (Paragraph 18). If the biomass assessment study demonstrates that the quantity of available biomass in the region is at least 25% larger than the quantity of biomass that is utilized including the project activity then this source of leakage will be neglected, otherwise the leakage shall be estimated and deducted from the emission reductions.
Monitoring frequency	Beginning of each crediting period
QA/QC procedures	In case a biomass assessment study needs to be carried out, a reputed authority will be employed.
Purpose of data	To calculate leakage emissions
Additional comment	The data will be archived till 2 years after the crediting period.

B.7.2. Sampling plan

Sampling is not required for this project activity

B.7.3. Other elements of monitoring plan

Monthly joint meter readings of the net electricity supplied to the grid/licensee recorded by the main meter and check meter would be taken by authorised representatives of DDEPL and grid/licensee. In case the main meter becomes defective, emission reductions would be based on readings recorded on the check meter located near the substation. Both these meters will be calibrated annually to ensure accuracy of readings. The same would be recorded and signed by both parties for the purpose of billing. The records of the same would be maintained at the plant. For cross checking purposes, the project proponent will also carry out measurements of gross electricity generation, auxiliary electricity consumption and biomass fuel consumption at the project generation site.

The following operational and management structure would be implemented for this purpose:

The recorded electricity data and biomass consumption data would be reviewed at the end of each day. The reports compiled by the shift in-charge would be forwarded to plant manager. On monthly basis, the reports would be prepared and forwarded to the senior management after final review and compilation by the plant manager.

The onus of reviewing, storing and archiving of information in a suitable manner lies on the plant manager. For this purpose, DDEPL has developed an internal audit procedure as a measure of internal control to ensure accuracy and credibility of data reported. The following parameters would be verified during the internal audit: Gross energy generated, auxiliary consumption, net electricity generated, biomass fuel inventory, average calorific value and calibration records. In case of any irregularity observed, necessary action would be taken immediately and corrective actions would

be suggested wherever required. DDEPL shall archive the complete metering data and this data would be preserved for at least two years after the end of the crediting period.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

27/08/2007

In accordance with the 'CDM glossary of terms' the start date of a project activity is defined as the "the earliest date at which either the implementation or construction or real action of a project activity begins".

The above definition of start date was further clarified by the CDM EB in its 41st meeting, according to which, the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity.

The start date has thus been chosen to be the date on which the project proponent had first committed to major financial expenditures related to the project activity. This is represented by the date of Purchase Order for design, manufacture and supply of bleed cum condensing TG Set with accessories.

C.2. Expected operational lifetime of project activity

25 Years

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable crediting period (second crediting period)

C.3.2. Start date of crediting period

Renewed start date of the crediting period: 08/06/2017

Previous crediting period: 08/06/2010 – 07/06/2017

C.3.3. Duration of crediting period

7 years 00 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The Environmental Impact Assessment (EIA) study was undertaken to incorporate the environmental and social considerations into the project planning and design process in order to ensure that the proposed independent biomass based power project under consideration is environmentally sound.

It was concluded that the project has fair benefits and advantages to the industry, state and people of the region. The adverse impacts are marginal and easy to mitigate. The use of biomass as fuel will limit uncontrolled burning of post-harvest agro-residues (which has significant adverse effects

on local as well as regional atmosphere). The construction activity might have some effect on local atmosphere due to dust from construction material. The effect will be localized and there would not be much effect on the SPM in the area, which will remain within the AAQS. Crop diversification, consequent to the project, will be slightly beneficial to local biological conditions and proper management of post-harvest residues will benefit terrestrial micro-flora/fauna.

Particulate matter and gases

The air pollution control system, for the combustion emissions from boiler furnace, will comprise of a ducting arrangement to transport emissions to the electro-static precipitator, an ID fan, and a stack. The boiler furnace emissions will be conveyed into the electro-static precipitator (ESP), where it will get cleaned (removal of SPM) before being discharged into the atmosphere, through a stack of adequate height.

The flue gas cleaning system will achieve SPM removal efficiency of more than 99.5%, resulting in emission discharge with SPM concentration of less than 50 mg/Nm^3.

Water pollution

Wastewater generated from the project activity will be reused for ash quenching and biomass spray. Remaining wastewater will be disposed (reuse for irrigation of self-owned agricultural land). The industrial unit will have different effluent streams needing segregated handling. The wastewater treatment system would comprise of following units; Neutralisation for DM plant regeneration effluent, bar screen for domestic wastewater, septic tank for domestic wastewater & combined treated wastewater storage tank.

The outflow of the septic tank will be obtained as treated wastewater. The system, while in proper stable operational condition, will achieve more than 75% reduction in BOD and TSS removal from domestic sewage. All the wastewater streams – DM plant regeneration effluent, boiler blow-down, cooling water blow-down, etc. – will be combined and disposed (reused for various purposes, such as, ash quenching, spray on biomass/fuel, irrigation of plantation, etc.). Treated domestic sewage will be disposed onto land for irrigation.

Solid waste

The project proponent will provide adequate arrangement for on-site storage of ash generated in the power plant. It will be stored in wet conditions to prevent it from getting air borne and affecting the local atmosphere. The ash will be disposed off to farmers (as soil conditioners) or to brick kilns (to be mixed with clay for brick making) of the region.

Noise

There will be some noise due to machinery and vehicles at the construction stage, but it will not be stressing beyond permissible limits. Though there will be some noise associated with the activities during operation stage as well, it is not expected to exceed the permissible limit at any point.

D.2. Environmental impact assessment

There are no significant environmental impacts due to the project activity.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

A stakeholder meeting was organized by the project proponent on 22 July 2008 to inform the local people on the environmental and social impacts of the project activity and discuss their concerns, if

any, regarding the activity. The invitation letter was prepared and sent out in advance on 15 July 2008 to the employees of the power plant, Sarpanchs of neighbouring villages, biomass traders and farmers. An attendance record of the people present at the meeting was maintained.

The representatives of Dee Development Engineers Pvt. Ltd presented the salient features of the project activity and requested for their suggestions/objections. The opinions expressed by them and their respective responses have been recorded

E.2. Summary of comments received

No adverse comments or concerns were raised by the stakeholders concerned. However, clarifications on the various aspects of the project activity were entertained and discussed in detail as tabulated below.

S.No.	Question/Enquiry/Description	Reply/Clarification by Company/Panel Members
1.	Asked about the proper management of fly ash so that, the health of local resident may not be affected.	Sr. Manager Plant replied that company has acquired approx. 20 acres land which is at present 5 ft down from road level therefore, it has the capacity to store the ash for 5 years. Company is also in the process of signing an agreement with Brick kiln and cement manufacturing industries.
2.	Enquired about the traffic problem may faced by the villagers due to vehicles carrying raw material and other materials. Also said to extend the strength and width of the bridges of the village.	Sr. Manager Plant replied that company has arranged for parking of 50 nos. of vehicles in its premises. He has replied that the material will be transported through light weight trolleys and other vehicles.
3.	Enquired about the fire risk of the stored raw material.	Sr. Manager Plant replied that we will construct the boundary wall around the Plant periphery and proper firefighting arrangements will be made.
4.	Project will provide employment to the nearby villagers and the electricity crisis will improve in the state. Generated ash may be used in the agriculture land as manure and they express their gratitude towards the promoter for setting up of the project.	No reply required.
5.	How the local resident will be safe, if your boiler bursts?	Sr. Manager Plant replied that safety valve and other safety equipments will be installed in our Boiler which release the extra steam produced by pressure. Besides this, there will be time-to-time inspection by the Boiler Inspector.
6.	How the farmers will be benefited by your project?	Sr. Manager Plant replied that the electricity generated by our project will increase the supply of electricity which will increase crop production. Apart from this, the company will purchase the agro-waste by which the farmers will be benefitted economically.
7.	How the pollution of your project will affect the soil and crop of the	Sr. Manager Plant replied that the ESP developed by the latest technology will be

	agriculture land?	installed in this project which will stop the ash particles emitted with the smoke through the chimney and hence, there will be no pollution from the ash emitted with the smoke. Besides this, company will plant tall and dense trees in its premises.

The villagers recognised the benefits associated with the project activity and No Objection Certificates were granted by the Panchayats depicting their full support to the project.

E.3. Consideration of comments received

There were no major comments or concerns raised during the consultation with stakeholders. All the minor comments were properly addressed to the satisfaction of stakeholders by the project proponent during the public hearing meeting. The potential benefits and advantages of the project activity for the local stakeholders were well acknowledged. Further, as required by the CDM process cycle, the PDD has already been published at the DOE`s web site for public comments.

SECTION F. Approval and authorization

Host Country Approval letter obtained from the DNA- India vide Letter No. 4/27/2008-CCC dated 27/01/2009.

Appendix 1. Contact information of project participants

Organization name	Dee Development Engineers Pvt. Ltd.
Country	India
Address	1255, Sector 14,Faridabad,Haryana-121007
Telephone	+91-1275-248200
Fax	+91-1275-262085
E-mail	klb@ddel.net
Website	http://www.deedevelopment.com/
Contact person	Mr. Krishan Lalit Bansal

Appendix 2. Affirmation regarding public funding

No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

Appendix 3. Applicability of methodologies and standardized baselines

Applicability of methodology(ies) has been explained in section B.2.

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

The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Combined Margin emission factor for the Indian grid, the details of which are available on the following website
http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

The procedures and formulas used for estimation of the baseline factor and the assumptions made have also been provided in details

Appendix 5. Further background information on monitoring plan

The monitoring plan has already been explained in section B 7

Appendix 6. Summary report of comments received from local stakeholders

No negative comments received from local stakeholders. Please refer section E of the PDD.

Appendix 7. Summary of post-registration changes

No post-registration changes has been done to the project activity

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN);Make editorial improvements.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.

Version	*Date*	*Description*
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: project activities, project design document