CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 Dec 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Project Title : 10 MW Biomass based Power Project by Sanjog Sugars & Eco-Power Private Limited

Version : 5

Dated : 02/01/2012

Revision History of PDD

Version number	Date of revision	Reason for revision/ edits
1	03/02/2011	Initial version
1.1	04/02/2011	Revision on Completeness Check comments
2	01/06/2011	Revision on PDD as per validation findings
3	13/08/2011	Revision to PDD as per validation findings (2)
4	26/09/2011	Revision to PDD as per validation findings (3)
5	02/01/2012	Revision to PDD as per Technical Review findings

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

The project activity of setting up a 10 MW biomass based power generation project in Rajasthan is promoted by Sanjog Sugars & Eco-Power Private Limited (SSEPPL). SSEPPL was incorporated on December 17, 2004 under the Companies Act. SSEPPL is engaged in the business of inter alia, purchasing, manufacturing and dealing in sugar products. SSEPPL is also engaged in generation of electricity or other energy and conventional and non-conventional energy sources on a commercial basis.

Project Activity:

The project activity involves setting up a 10 MW biomass based power generation at Sangaria, Hanumangarh District of Rajasthan, India, which will generate electricity and supply to the regional (Northern, Eastern, Western, North Eastern - NEWNE) electricity grid. The project activity consists of installation of one 47 TPH boiler with outlet parameters of 475^0C temperature and 66 kg/cm^2 (atm) pressure and one bleed cum condensing turbine of capacity 11.5 MW (normal output) with a rated output of 10 MW. The biomass which will be used for power generation in the project activity mainly includes cotton stalks and mustard husk available in the region. Other seasonally available renewable biomass residues in small quantities might be utilised in force majeure conditions like change in cropping pattern.

Purpose of the Project activity:

The purpose of the project activity is to utilize the surplus biomass available in the region for generation of electricity and supply to the regional (NEWNE) grid to meet the ever-increasing demand for energy in the region and country. Thus the project activity results in the reduction of GHG emissions associated with generation of equivalent amount of power in the fossil fuel dominant regional (NEWNE) electricity grid. The electricity generated from the project activity will be around 61,670 MWh and the project activity would potentially reduce around 51,803 tCO_2e annually.

Contribution of the project activity to sustainable development

Ministry of Environment and Forests (MoEF), Govt. of India has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects[1]:

Social Well Being

- The project activity generates employment opportunities for local people during the construction and operation stages.
- Strengthening the local grid by supply of power.

Economic Well Being

- This project increases the income of the surrounding population by providing employment opportunities to them.
- At a national level, use of renewable energy resource for generation of grid quality power, help conserve foreign exchange by reducing the need to import fossil fuels to meet the country's growing energy demand.

Environmental Well Being

- Conservation of non-renewable resources.
- Reduce the green house gas emission by the generation and supply of green power to the grid.
- Reduce other pollutants like SOx, NOx etc associated with conventional (fossil fuel based) power generation systems.

Technological Well Being

- The successful functioning of the project activity will generate interest in small and medium industries sector to invest in renewable energy based power plant.
- Enhanced interest in biomass based power generation will lead to greater research in the area which may help find solutions to the technological challenges associated with firing biomass in boilers.
- Further, successful adoption of this model by other industries will lead 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.

[1] http://envfor.nic.in/divisions/ccd/cdm_iac.html

A.3. Project participants:

Name of party involved (*) ((host) indicates a host party)	Private and/or Public entity (ies) project participants (*)	Kindly indicate if the Party involved wishes to be considered as project participant
India (host)	M/s Sanjog Sugars & Eco-Power Private Limited (Private Entity)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting the registration, the approval by the Party(ies) involved is required.		

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

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

A.4.1.1. Host Party (ies):

Country: India

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

State: Rajasthan

A.4.1.3. City/Town/Community etc:

Village/Town : Sangaria
District : Hanumangarh

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity:

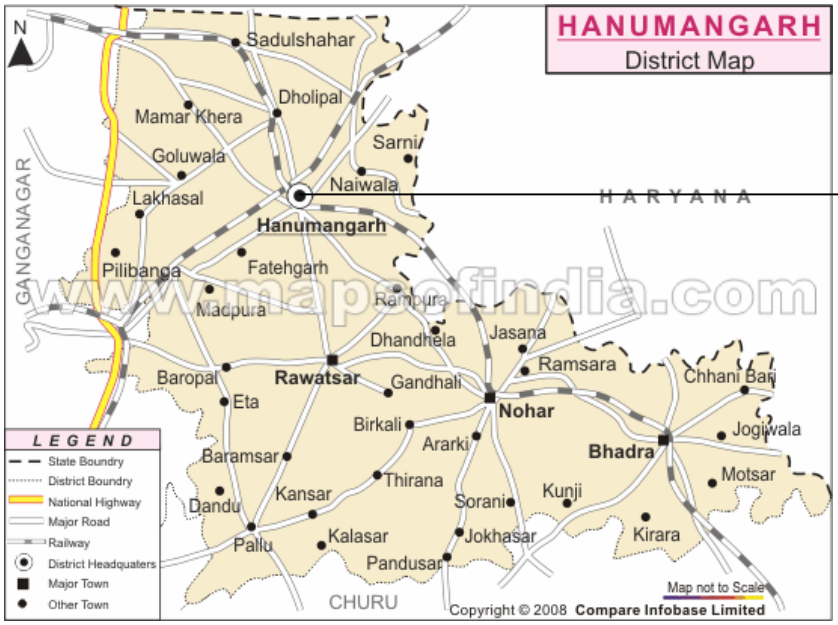
Project Site

The project site is located in Sangaria Village, Hanumangarh District. The nearest railway station is Hanumangarh. The nearest airport is Delhi airport.

Latitude 29° 45' 16.86" N
Longitude 74°28' 00.70" E

Country Map

District Map



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

According to the Small Scale CDM modalities the project activity falls under:

Type	Sub Group	Sectoral Scope
I – Renewable Energy Project	D – Grid connected Renewable electricity generation, Version – 16	01

The project activity is a biomass based power generation project which uses the abundantly available biomass as fuel for generating power to be supplied to a regional (NEWNE) electricity grid.

Technology

The technology of the thermal power generation is a well established and proven one. The main principle of thermal power generation is the conversion of energy available in various fuels to generate mechanical power and converting them to electrical power through turbine.

The primary biomass considered for the project activity is cotton stalk and mustard husk available in the region, also other seasonally available biomass residues may be utilised. The proposed system consists of steam generator of 47 TPH capacity at 66 kg/cm^2 (atm) pressure, 475^{0}C temperature. The boiler is bi-drum, natural circulation and balanced draft type. The combustion system of the boiler shall be travelling grate with spreader stoker. The boiler unit includes superheater, economizer, drum and air-preheater. The boiler will have sub systems like pressure parts, feeding system, firing system, draft system, feed water system, Electro Static Precipitator (ESP) and chimney.

The steam generated from the boiler drives the steam turbine of bleed cum condensing type with a normal output of 11.5 MW and rated output of 10 MW. The turbo generator unit is provided with all necessary auxiliary equipment including condensate pump, ejectors, gland steam condenser, ejector condenser. The power generated will be fed to the regional (NEWNE) electricity grid.

Characteristics of Biomass (Cotton stalk)[2]:

Characteristics	Value
Fixed Carbon	19.2%
Volatile Matter	76.0%
Ash	4.80%

[2] Biomass Assessment Report (Page no.: 27)

Characteristics of Biomass (Mustard Husk)[3]:

Characteristics	Value
Fixed Carbon	19.5%
Volatile Matter	70.0%
Ash	6.27%

The technical specifications of all the equipment are as follows:

Technical specification of Travelling grate boiler:

Description	Specifications
Make	ISGEC JOHN THOMPSON
Type	Natural circulation, vertical bi-drum, semi-outdoor installation
Maximum continuous rating	47 tph
Grate	Travelling grate
Steam pressure at superheater outlet	66 kg/cm^2 (atm)
Steam temperature at superheater outlet	475+- 5^0C
Feed water temperature at economizer inlet	130^0C

Technical parameters of Turbogenerator:

Description	Specifications
Make	Triveni Engineering and Industries Limited
Type	Multistage, Horizontal axle blade design, Impulse type bleed cum condensing steam turbine
Rated capacity of turbine	10000 kW
Steam pressure of turbine inlet	64 kg/cm^2
Steam temperature at turbine inlet	475^0C
Condenser pressure	0.1 kg/cm^2
Cooling water temperature at inlet to condenser	32^0C

Technical specification of Air cooled condenser[4]:

Description	Specifications
Make	GEI Industrial Systems Ltd
Turbine exhaust steam flow rate	41.7 tons/hr
Turbine back pressure	0.18 ata
Turbine exhaust steam enthalpy	576.93 kCal/kg
ACC design ambient temperature	42^0C

[3] Biomass Assessment Report (Page no.: 23)

[4] As provided by the EPC contractor

Technical specification of Electrostatic precipitator[5]:

Description	Specifications
Make	Thermax Ltd
Gas flow	124200 Am^3/hr
Gas temperature	160^0C
Dust concentration at ESP inlet	10 gm/Nm^3
Clean gas burden at ESP outlet with all fields	50 mg/Nm^3

Technical specification of AC generator[6]:

Description	Specifications
Make	**TDPS**
Output	15000 kVA
Standard	IS 4722
Voltage (AC)	11000 V
Current (AC)	767 A
Frequency	50 Hz

Deployment of environmentally safe technology:
The power plant is designed to be an environment friendly facility. The plant emissions will be within permitted levels as per statutory/regulatory requirements. ESP will be used to limit particulate emission to acceptable levels. The ash collection and disposal system is well designed using conveyors. Water spray nozzles for dust suppression will be installed at the junctions with the ash transfer conveyor. Thus the technology employed is environmentally safe and sound.

There has been no technology transfer to the host country as all equipment has been purchased from reputed manufacturers in the host country itself.

[5] As provided by the EPC contractor

[6] As provided by the EPC contractor

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Estimation of annual emission reductions in tonnes of CO_2e
Year 1*	51,803
Year 2	51,803
Year 3	51,803
Year 4	51,803
Year 5	51,803
Year 6	51,803
Year 7	51,803
Year 8	51,803
Year 9	51,803
Year 10	51,803
Total estimated reductions (tonnes of CO_2e)	518,030
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period	51,803

*Year 1 starts from the date of registration of the project activity with the CDM EB of UNFCCC.

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

There is no public funding involved in this project activity.

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

Paragraph 2 of Annex 13 of EB 54 "Guidelines on Assessment of Debundling for SSC Project Activities"[7] states that:

"A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- *With the same project participants;*

[7] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

- *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"*

There is no other project activity registered or put up for registration by the PP for renewable energy generation units. Thus the project activity is not a de-bundled component of a large project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

Title : Grid connected renewable electricity generation
Methodology : AMS-I.D.[8]
Version : 16
Validity : Requests for registration can be submitted until 17 Feb, 2012 23:59:59 GMT

The methodology also makes reference to the "Non-binding best practice examples to demonstrate additionality for SSC project activities"[9].

It refers "Guidance on the Assessment of Investment Analysis" (Version 5) (EB - 62, Annex 5-)[10].
Also it refers, Tool to calculate the emission factor for an electricity system" (Version - 02.2.0, EB- 61, Annex 12)[11]
It refers, "General guidance on leakage in biomass project activities" Version 3[12]

B.2 Justification of the choice of the project category:

The project activity is a biomass based power generation unit and the electricity generated will be supplied to the regional (NEWNE) grid. The project activity uses the approved methodology AMS I.D (Version 16) for small scale project activities. The applicability conditions as per the methodology and the corresponding project condition are illustrated below.

Applicability Criteria	Project Activity
This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid. Project activities that displace electricity from an electricity distribution system	The project activity involves the setting up of 10 MW renewable biomass (cotton stalk and mustard husk available in the region, also other seasonally available biomass residues may be utilised) based power generation unit and the electricity generated will be supplied to the regional grid which is the

[8] Reference: https://cdm.unfccc.int/UserManagement/FileStorage/TENOK8BM5U3AJIHQZ69YS7CPVDXG41

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

[10] Reference: http://cdm.unfccc.int/filestorage/O/H/N/OHNFC4T6RUZEQXDL20JVG7MWK35YI1/eb62_repan5.pdf?t=QWJ8MTMxMTY2NTg5Ny4wNg==|QbiPUI4DeXq7zFF9HjpDSsQ36V0=

[11] Reference: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf

[12] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid04.pdf

Applicability Criteria	Project Activity
that is or would have been supplied by at least one fossil fuel fired generating unit shall apply AMS I.F.	NEWNE grid. Hence this condition is applicable.
This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition1; (c) involve a retrofit[13] of (an) existing plant(s); or (d) involve a replacement[14] of (an) existing plant(s).	The project activity of setting up of renewable biomass based power generation is a new facility. Hence this condition is applicable.
Hydro power plants with reservoirs 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, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	The project activity does not involve hydro power generation. Hence this condition is not applicable.

[13] Retrofit (or Rehabilitation or Refurbishment). It involves an investment to repair or modify an existing power plant/unit, with the purpose to increase the efficiency, performance or power generation capacity of the plant, without adding new power plants or units, or to resume the operation of closed (mothballed) power plants. 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.

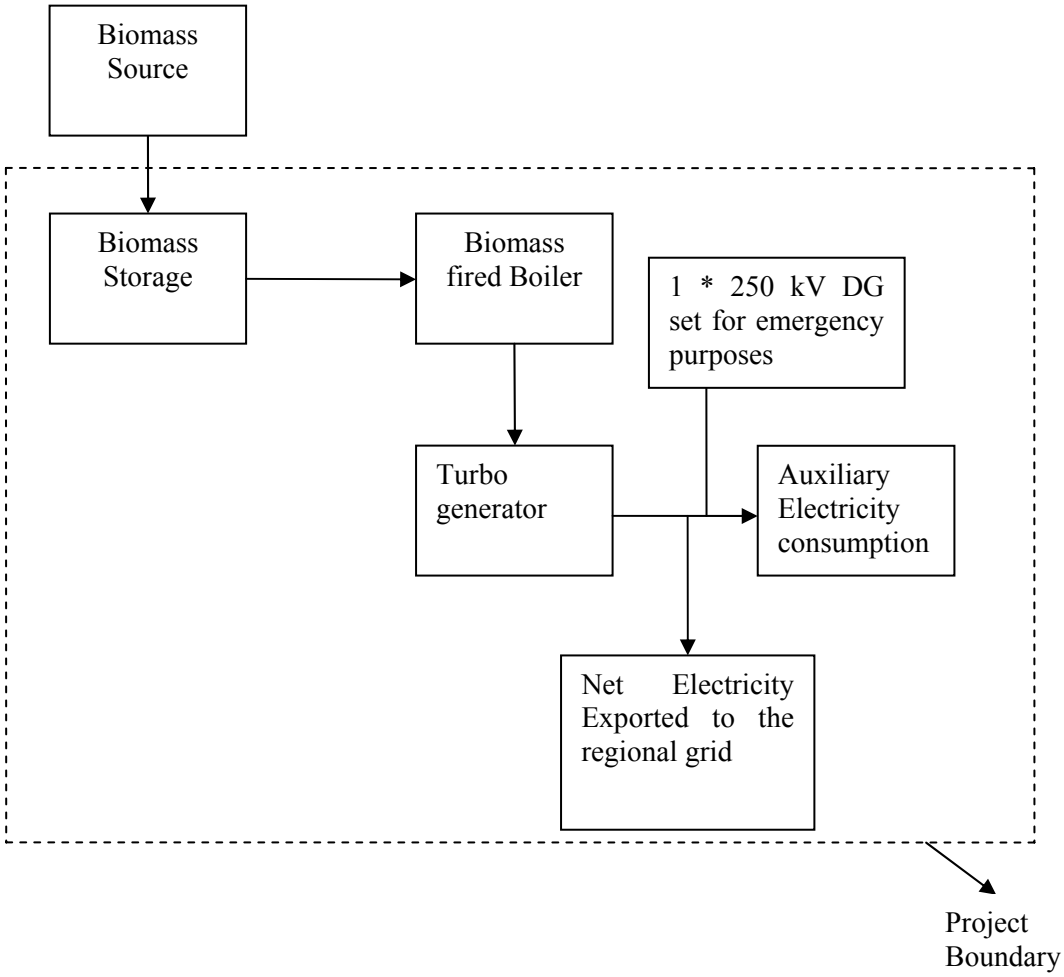
14 Replacement. It involves investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The installed capacity of the new plant or unit is equal to or higher than the plant or unit that was replaced.

Applicability Criteria	Project Activity
In the case of biomass power plants, no other biomass types than renewable biomass[15] are to be used in the project plant.	The biomass used in the project activity is the cotton stalk and mustard husk which is the renewable biomass according to the definition of renewable biomass as per Annex 18, EB 23 which does not affect the carbon sink. Hence this condition is applicable.
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, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity only comprises of renewable component (i.e. Biomass). The installed capacity of the project is 10 MW which is lower than 15 MW_e, limit set for small scale project activity. Hence this condition is applicable.
Combined heat and power (co-generation) systems are not eligible under this category.	The project activity does not involve combined heat and power (co-generation) systems and thus the condition is not applicable.
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 distinct6 from the existing units.	The project activity does not involve the addition of renewable energy generation units at an existing renewable power generation facility. Hence this condition is not applicable.
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	The project activity does not involve retrofit or replacement. Hence this condition is not applicable.

[15] Refer to Annex 18, EB 23 for the definition of renewable biomass.

B.3. Description of the project boundary:

As per the methodology AMS I D, Version 16, the project boundary encompasses the physical, geographical site of the renewable generation source.



B.4. Description of baseline and its development:

In line with paragraph 10 of the methodology the baseline scenario for the project is that equivalent amount of power which would have been generated by the operation of the grid connected power plants and by the addition of new fossil fuel based generation sources.

The project activity involves setting up a 10 MW biomass based power generation plant that generates electricity and supplies to the grid. This generated electricity would otherwise have been supplied by fossil fuel based grid. Hence as per Para 10 of the methodology the baseline scenario for the project activity is the electricity delivered to the grid by the project activity.

For baseline determination as per paragraph 11 of the methodology AMS-I.D., Version 16, the baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

The formula used for baseline estimation is as follows:

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

Where:

BE_y = Baseline Emissions in year y; tCO_2e

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

$EF_{CO,grid,y}$ = CO_2 emission factor of the grid in year y (tCO_2e/MWh)

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'.
(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.

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

As the project activity displaces the power that would have been obtained from grid, the option (a) is used for calculation of emission factor. The emission factor of the grid has been calculated based on combined margin (CM) approach.

Identification of the relevant grid:

The Central Electricity Authority (CEA), Ministry of Power, Government of India (Host Country) has given the delineations of the project electricity system and the connected electricity system in India. As per CEA, the Indian power system is divided into two regional grids, viz. NEWNE Grid & Southern Grid. As the project activity is located in the State of Rajasthan, NEWNE Grid will be the relevant electricity system.

Geographical scope of the electricity generation system:

NEWNE Grid				**Southern 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	Tamilnadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Lakshadweep
Punjab	Andaman-Nicobar	Maharastra	Nagaland	
Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttarakhand				

Following are the information used for baseline estimation:

Particulars	Unit	Value	Source
Capacity of the plant	MW	10	DPR
Plant load factor	%	80	DPR
Gross energy generation	MWh	70,080	Calculated
Auxiliary consumption	%	12	DPR
Auxiliary energy consumption	MWh	8,410	Calculated
Net energy generation	MWh	61,670	Calculated
Emission factor of NEWNE grid	tCO_2e/MWh	0.84	Calculated

The calculation of the baseline emission factor using the Combined Margin methodology has been detailed under Section B.6.1

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The project activity is additional as per the options provided under 'Non-binding best practice examples to demonstrate additionality for SSC project activities'According to the Non-binding best practice examples to demonstrate additionality for SSC project activities (EB 35, Annex 34)[16]:

"Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) *Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions*
(b) *Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions*
(c) *Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions*
(d) *Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher."*

Among the multiple barriers identified in the implementation of the project activity, the investment analysis is used to demonstrate the financial non-viability of the project activity in absence of carbon revenue in a conservative and transparent manner. The project activity involves high investment cost, wheras the returns generated from the project activity relatively are low and hence the CDM funds are considered essential for improving the returns from the project.

Investment Barrier:

The investment barrier has been demonstrated in accordance with the Non-binding best practice examples to demonstrate additionality for SSC project activities provided by CDM EB in its 35th Meeting (Annex 34), 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 because the baseline scenario for the project activity is the electricity generation from NEWNE grid, for which no investment is required by the Project

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

Participant, hence benchmark approach is best suited approach for PP based on the reference to the Guidance 19 of Annex 5- of EB 62, " *The benchmark approach is therefore suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest.*" This analysis has been selected and conducted in accordance with the 'Guidance on the Assessment of Investment Analysis[17]' (Version 5) (EB-62, Annex 5-).

As per the guidance, the most suitable financial indicator for the project activity is determined to be the Project IRR. The following assumptions are considered to calculate the Project IRR of the project activity:

Technical parameters:

Particulars	Unit	Value	Source
Capacity of the plant	MW	10	DPR (Page no. 98
Plant load factor	%	80	DPR (Page no. 98)
Gross energy generation	MWh	70,080	Calculated
Auxiliary consumption	%	12	DPR (Page no. 98)
Auxiliary energy consumption	MWh	8,410	Calculated
Net energy generation	MWh	61,670	Calculated
Emission factor of NEWNE grid	tCO_2e/MWh	0.84	Calculated using "CEA Database, Version 5.0". Refer section B.6.1

Financial parameters:

Particulars	Unit	Value	Source
Land cost	INR Million	11.70	DPR
Civil Works	INR Million	54.4	
Plant & Machinery	INR Million	410.7	
IDC	INR Million	16	
Preliminary/Pre-operative Expenses	INR Million	14.3	
Margin Money for Working Capital	INR Million	21.5	
Total project cost	INR Million	528.60	
Depreciable cost	INR Million	516.90	Calculated
Total cost per MW	INR Million	52.86	Calculated

[17] http://cdm.unfccc.int/EB/051/eb51_repan58.pdf

Source of funds			
Debt	INR Million	370.00	DPR (70% of total project cost)
Equity	INR Million	158.60	DPR (30% of total project cost)
Operating costs			
Operating and maintenance expense	INR Million	34.36	DPR (6.5% of total project cost)
Escalation in O & M cost	%	5	DPR (5% from second year onwards)
Fuel cost			
Specific consumption of cotton stalk	kg/kWh	1.203	Calculated (Ref: DPR page 22)
Specific consumption of mustard husk	kg/kWh	1.308	Calculated (Ref: DPR page 21)
Cost of fuel (cotton stalk)	Rs/Tonne	1,400	Average of the cotton stalk price range as given in the DPR page 21
Cost of fuel (mustard husk)	Rs/Tonne	1,400	Average of the mustard husk price range as given in the DPR page 20
Escalation in fuel cost	%	5	DPR (Refer page 98)
Tariff rate			
Year 1	Rs/kWh	3.96	http://mop.rajasthan.gov.in/downloadpdf/nonconventinalenerypolicy.pdf (Refer Appendix-2)
Year 2	Rs/kWh	3.99	
Year 3	Rs/kWh	4.05	
Year 4	Rs/kWh	4.12	
Year 5	Rs/kWh	4.19	
Year 6	Rs/kWh	4.27	
Year 7	Rs/kWh	4.35	
Year 8	Rs/kWh	4.43	
Year 9	Rs/kWh	4.52	
Year 10	Rs/kWh	4.62	
Year 11	Rs/kWh	4.80	
Year 12	Rs/kWh	4.98	
Year 13	Rs/kWh	5.17	
Year 14	Rs/kWh	5.36	
Year 15	Rs/kWh	5.57	
Year 16	Rs/kWh	5.78	
Year 17	Rs/kWh	6.00	
Year 18	Rs/kWh	6.23	
Year 19	Rs/kWh	6.47	
Year 20	Rs/kWh	6.72	
Tax component			
MAT	%	11.33	As per Income Tax Act during 2008-09

			http://www.caclubindia.com/experts/mat-f-y-2008-09-rate-246020.asp
Corporate tax	%	33.99	As per Income Tax Act during 2008-09 http://business.mapsofindia.com/india-budget/2008/
Depreciation			
Depreciation rate as per companies act	%	5.28	Rates of Depreciation as per Companies Act Schedule XIV (Ref: http://www.apurvrelan.com/Depreciation%20Chart%20As%20Per%20Companies%20Act.pdf)
Depreciation rate as per income tax	%	80	Rates of Depreciation from Income Tax Act (Ref: http://taxclubindia.com/simple/depreciation%20rates%202009-10.pdf)
CDM component			
CER price	Euro/CER	15	Assumption
Euro – Rupee conversion	Rs/Euro	62	Assumption

Establishing Benchmark:

In accordance with the EB "Guidance on the assessment of Investment Analysis" EB 62, Annex 5-, In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. *Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for the project IRR.*

Based on this the PP has taken into account the Local commercial lending rates as the Benchmark Return.

The PP has considered the Base Prime Lending Rate (BPLR) of Reserve Bank of India (RBI) as Benchmark for the project IRR. The BPLR of RBI was 12.25 -12.75% at the time of decision making. Hence the Benchmark is considered as 12.50%[18] for the project activity.

Results:

Project IRR	IRR Value
With CDM revenue	15.19%
Without CDM revenue	4.22%
Benchmark	12.50%

Considering the above mentioned assumptions over a period of 20 years, without considering the CDM revenues the Project IRR is 4.22 %. When the revenues from CDM are considered the Project IRR improves to 15.19 %. Hence the project proponent has considered CDM funds as an additional source of revenue for the project activity thus improving the viability of the project.

[18] http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/84504.pdf

Sensitivity Analysis:
The sensitivity analysis is carried out to analyze the robustness of the financial attractiveness of the project activity with and without the CDM revenues. As per paragraph 20 of "Guidelines on the assessment of investment analysis" demonstrated in EB 62, Annex 5-.

Sensitivity analysis has been conducted considering the following critical parameters:

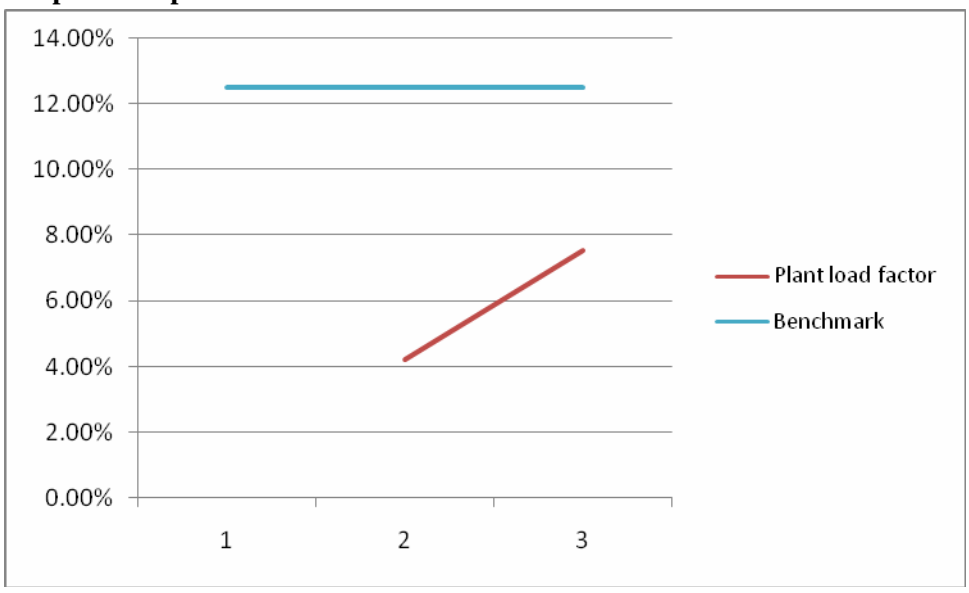
- Plant Load Factor (PLF)
- Operation and Maintenance cost
- Project cost
- Tariff rate
- Biomass price

Sensitivity factor 1: PLF
As there is probability of variation in PLF as it is dependent on many variables like grid availability, breakdown / shutdowns etc., has been chosen as the parameter for variation which can directly affect the revenue to the project.

Range of variations for the PLF:
The sensitivity analysis is carried on by varying the PLF by +/- 10% and finding out the corresponding change in IRR. The results and their graphical representation are described as below:

Factor	Variation	IRR	Benchmark
PLF	-10%	-	12.50 %
	0%	4.22 %	12.50 %
	10%	7.53 %	12.50 %

Graphical Representation:



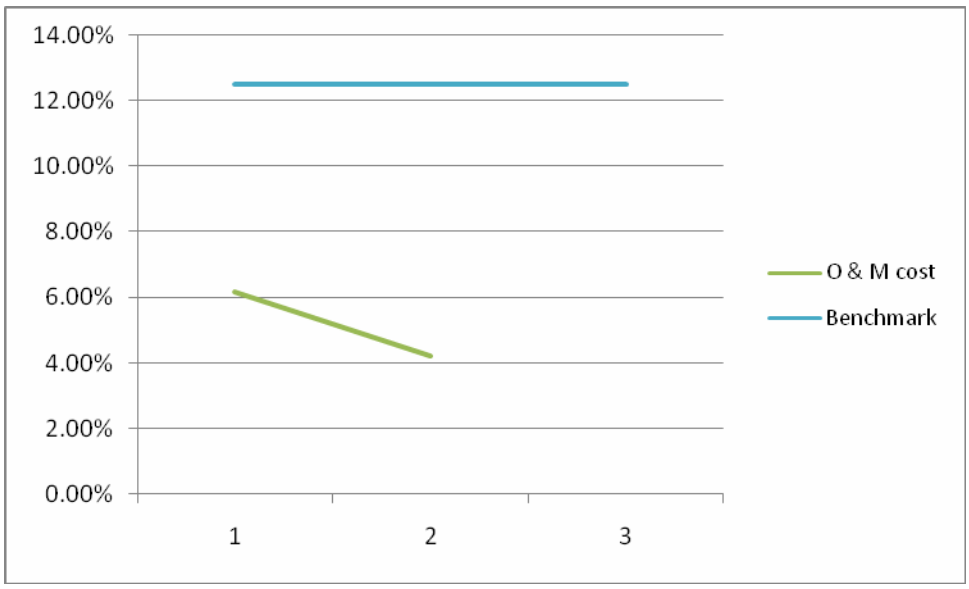
The above analysis shows even if the PLF range varies widely in between +/- 10%, with the maximum increase in PLF, the project IRR does not reach the Benchmark. Hence, the project activity is not economically viable.

Sensitivity factor 2: Operation and Maintenance cost:
On the other hand the parameter which can affect 20% of the total cost is the operation and maintenance cost which is an indicative amount which could make the IRR unfavorable or favorable. Hence this parameter has been chosen.

Range of variations for the Operation and Maintenance Cost:
The sensitivity analysis is carried on by varying the operation and maintenance cost by +/- 10% and finding out the corresponding change in IRR. The results and their graphical representation are described as below:

Factor	Variation	IRR	Benchmark
Operation & Maintenance cost	-10%	6.17 %	12.50 %
	0%	4.22 %	12.50 %
	10%	-	12.50 %

Graphical Representation:



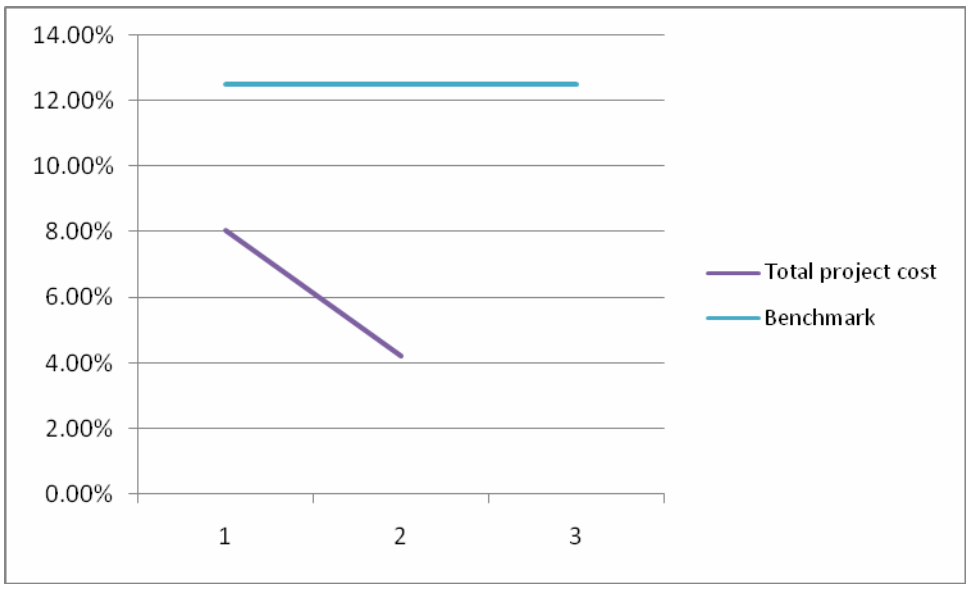
The above analysis demonstrates change in operation and maintenance cost in a range of +/- 10%, even at the lowest operation and maintenance cost, it does not reach the benchmark, hence the non-viability of the project activity is evident.

Sensitivity factor 3: Project cost:
The parameter which can affect 20% of the project activity is the investment cost (Project Cost) would have like to have change due to several reasons and thus make the IRR unfavourable or favourable and has been chosen as the parameters for variations.

Range of variations for the Project Cost:
The sensitivity analysis is carried on by varying total project cost by +/- 10% and finding out the corresponding change in IRR. The results and their graphical representation is described as below:

Factor	Variation	IRR	Benchmark
Total project cost	-10%	8.06 %	12.50 %
	0%	4.22%	12.50 %
	+10%	-	12.50 %

Graphical Representation:



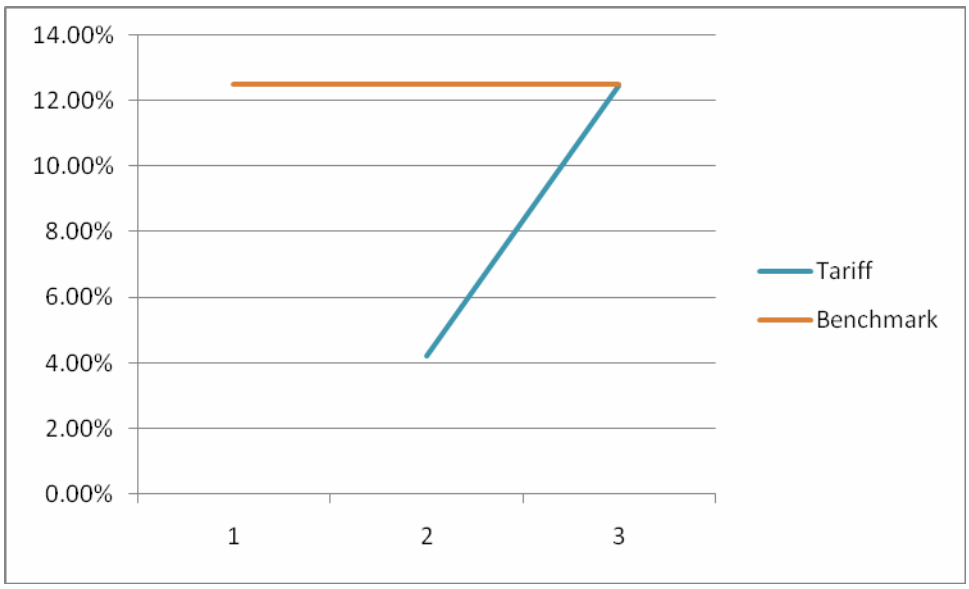
The above analysis demonstrates that change in project cost in a range of +/- 10%, even at the lowest project cost, it does not reach the benchmark, and hence the non-viability of the project activity is evident.

Sensitivity factor 4: Tariff rate:
The parameter which can affect 20% of the project activity is the tariff rate would have like to have change due to several reasons and thus make the IRR unfavourable or favourable and has been chosen as the parameters for variations.

Range of variations for the Tariff rate:
The sensitivity analysis is carried on by varying tariff rate by +/- 10% and finding out the corresponding change in IRR. The results and their graphical representation is described as below:

Factor	Variation	IRR	Benchmark
Tariff rate	-10%	-	12.50 %
	0%	4.22%	12.50 %
	+10%	12.47 %	12.50 %

Graphical Representation:



The above analysis demonstrates that change in project cost in a range of +/- 10%, even at the lowest project cost, it does not reach the benchmark, and hence the non-viability of the project activity is evident.

Sensitivity factor 5: Biomass price:

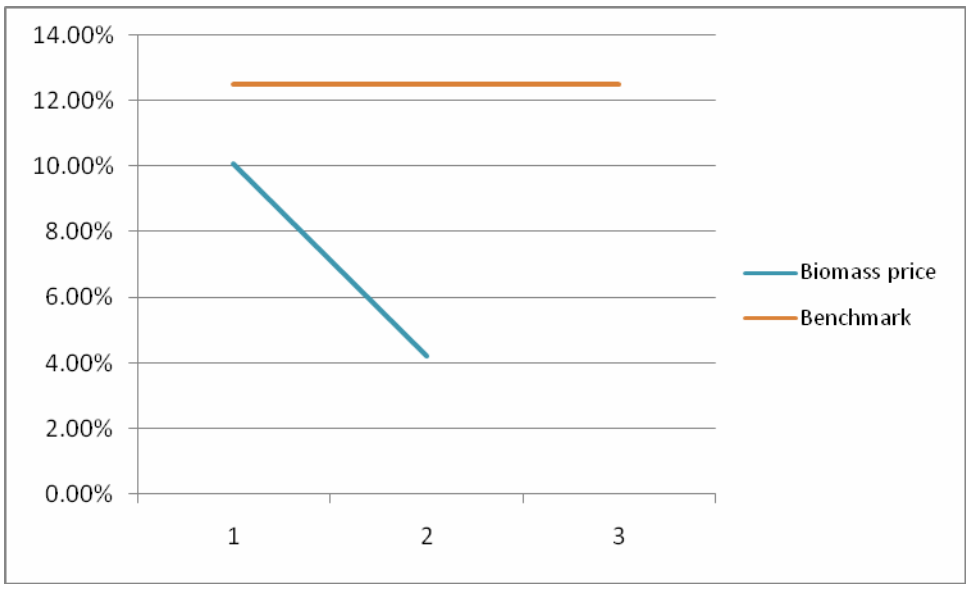
Biomass price is one of the parameters which can affect 20% of the project activity and would change due to several reasons and thus make the IRR unfavourable or favourable and has been chosen as the parameters for variations.

Range of variations for the Biomass price:

The sensitivity analysis is carried on by varying biomass price by +/- 10% and finding out the corresponding change in IRR. The results and their graphical representation is described as below:

Factor	Variation	IRR	Benchmark
Biomass Price	-10%	10.08%	12.50 %
	0%	4.22%	12.50 %
	+10%	-	12.50 %

Graphical Representation:



The above analysis demonstrates that change in biomass price in a range of +/- 10%, even at the lowest price of biomass, it does not reach the benchmark, and hence the non-viability of the project activity is evident.

As per para 21 of EB 62 Annex 5, sensitivity analysis beyond a range of +10% and 10% has also been considered to find out the scenarios which will result in the project activity passing the benchmark.

1. **PLF: Beyond variation by (+) 28% (i.e. PLF=102%) IRR will be passing the benchmark, but 102% PLF is not a possible scenario.**
2. **Operation & Maintenance: Beyond variation by (-) 57.13% IRR will be passing the benchmark, but it is highly unlikely scenario.**
3. **Project Cost: Beyond variation by (-) 21% IRR will be passing the benchmark, but (-) 21% variation in project cost is not a possible scenario and the cost has already been certified by lending bank.**
4. **Tariff: Any negative variation in tariff is highly unlikely as it has already been fixed for the project activity.**
5. **Biomass Price: Beyond variation by (-) 15.6% IRR will be passing the benchmark, but a negative variation in biomass price is not a possible scenario as there is a continuous trend of increase in biomass price.**

Conclusion:

In the above back ground it can be concluded that the project is not a Business as usual scenario. It is additional and would continue to remain additional irrespective of any changes in the critical parameters. It is in the above back ground that the registration of the project as CDM project activity assumes significance in as much as the project IRR breaches the bench mark with CDM benefits (15.19% as against the bench mark of 12.5%).

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Project IRR	IRR Value
With CDM revenue	15.19%
Benchmark	12.50%

Demonstration on Prior CDM consideration:

The Board of directors of the company SSEPPL had decided to undertake this project activity with due consideration of CDM and specifically authorized its personnel to take serious actions, during the meeting of the board of Directors.

Chronology of events:

The following table gives the chronology of events taken by PP in continuing and real actions that were taken both on the CDM front and the project implementation front related to the project activity.

S.No	Events	Date
1	Biomass Assessment Study Report	Feb 2008
2	Detailed Project Report	April 2008
3	Offer for Boiler from ISGEC John Thompson	16th May 2008
4	Board resolution passed by the board of directors to set up the project activity under CDM benefits.	20th May 2008
5	Letter of Intent (LOI) for supply of Boiler	16th June 2008
6	Offer for Turbine from Triveni Engineering Industries	29th Aug 2008
7	Contract for Civil, structural & allied works from M/s DKD Project Pvt Ltd	1st Sep 2008
8	LOI for supply of turbine	5th Sep 2008
9	Approval for Power evacuation for 10 MW	5th Nov 2008
10	LOU signed with CDM consultant First Climate (India) Pvt. Ltd. For developing the PCN and PDD document	26th May, 2009
11	Environmental clearance from MoEF	16th July 2009
12	Turbine transfer letter for supply, design, engineering, erection and commissioning to M/s Shriram EPC Limited	12th Jan 2010
13	Boiler transfer letter for supply of machinery and equipment to M/s Shriram EPC Limited	13th Jan 2010
14	Sanction letter for term loan from Punjab national bank	5th March 2010
15	Purchase order for supply of power plant equipment from M/s Shriram EPC Limited	24th April 2010
16	Stakeholder meeting	19th Oct 2010
17	Contract signed for Validation services of the project	31st Jan 2011
17	PDD webhosted for Global Stakeholder Consultation Process	9th Feb 2011 – 10th Mar 2011
18	Validation site visit	14th – 16th Mar 2011

National Policies and Circumstances:
In terms of EB 22, Annex 3, baseline scenario should be established taking into account relevant national and/or sectoral policies and circumstances, such as Electricity Act and National Electricity Plan. The Electricity Act and National Electricity Plan which were established in 2003 are the applicable policies to project activity in establishing the baseline scenario. Since this policy was introduced after 11 November 2001, these can be excluded under E+/E- policy.

Para 7(a) of same states that, only those national and/or sectoral policies or regulations under paragraph 6(a) i.e. type E+ policy that increase GHG emissions, that have been implemented before adoption of the Kyoto Protocol by the COP (decision 1/CP.3, 11 December 1997), shall be taken into account when developing a baseline scenario. For more GHG emitting power sector, no policy with comparative advantage existed before 11 December 1997. Hence, it is not applicable for baseline determination.

Para 7(b) of the same state, that those National and/or sectoral policies or regulations under paragraph 6 (b), i.e., type E- policy that decrease GHG emissions, that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) need not be taken into account in developing a baseline scenario. Hence, the baseline scenario is the electricity generation by grid connected fossil fuel dominated power plants.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions:

As per paragraph 11 of the methodology AMS I D, Version 16, the baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

The formula used for the calculation of baseline is as follows:

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

Where:

BE_y = Baseline Emissions in year y; tCO_2e

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

$EF_{CO_2,grid,y}$ = CO_2 emission factor of the NEWNE grid in year (tCO_2e/MWh)

Now,

CDM – Executive Board

$EG_{BL,y} = EG_{export,y} - EG_{import,y}$

Where,

$EG_{export,y}$ = Electricity exported to the grid in the year y

$EG_{import,y}$ = Electricity imported from the grid in the year y

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 ans electricity system'.
(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.

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

As the project activity displaces the power that would have been obtained from grid, the option (a) is used for calculation of emission factor. The emission factor of the grid has been calculated based on combined margin (CM) approach.

The emission factor has been estimated using the following six steps of according to "Tool to calculate the emission factor for an electricity system" (Version -2.2, EB- 61, Annex 12):

Step 1: Identify the relevant system:

The CEA, Ministry of Power, Government of India (Host Country) has given the delineations of the project electricity system and the connected electricity system in India. As per CEA, the Indian power system is divided into two regional grids, viz. NEWNE Grid & Southern Grid. Each grid covers several states as given in the following table. As the project activity is located in the State of Rajasthan, NEWNE Grid will be the relevant electricity system.

Geographical scope of the electricity generation system:

NEWNE Grid				**Southern 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	Lakshadweep

Punjab	Andaman-Nicobar	Maharastra	Nagaland	
Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttarakhand				

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional):
Option I (Only grid power plants are included in the calculation) is applicable as the grid system in India is very stable enough and off grid generation is not significant.

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:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

Out of the above options, the simple OM method (option a) is used in India. The Dispatch data analysis OM is not used as off-grid generation is not significant in India as per step 2 above. Other methods cannot currently be applied in India due to lack of necessary data.

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:

• 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. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.

• 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. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

Among the two options the (option a) the ex-ante option is chosen for emission factor calculation.

As per emission factor tool, the simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

In India as per available data (most recent five years) with CEA, the low-cost/must-run resources constitute 17.93% (NEWNE Grid) for which is less than 50% of total grid generation.

	Share of low cost / must run (% of net generation)[19]				
Year	2004-05	2005-06	2006-07	2007-08	2008-09
NEWNE grid	16.84	18.0%	18.5%	19.0%	17.3%
Average of most recent five years (NEWNE grid)	**17.93%**				

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

The operating margin describes the average CO_2 intensity of the existing stations in the grid which are most likely to reduce their output if a CDM project supplies electricity to the grid (or reduces consumption of grid electricity). The simple operating margin is the weighted average emissions rate of all generation sources in the region except so-called low-cost or must-run sources. In India, hydro and nuclear stations qualify as low-cost / must run sources and are excluded. The operating margin, therefore, can be calculated by dividing the region's total CO_2 emissions by the net generation of all thermal stations. In other words, it represents the weighted average emissions rate of all thermal stations in the regional grid.

Simple Operating Margin:

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. The values of OM have been taken from CEA Database which has been calculated based on "Tool to calculate the emission factor for an electricity system". The value of simple operating margin emission factors is 1.004 tCO_2/MWh (NEWNE Grid).

Parameter	2006-7	2007-08	2008-09	Remarks
NEWNE Simple OM excl imports (tCO2/MWh)	1.016397044	1.012997158	1.020625307	CEA Database, Version 5.0
NEWNE Net Generation in OM (GWh)	379470.5978	401641.586	421802.6329	CEA Database, Version 5.0
NEWNE Absolute emissions in OM (tCO2)	385692793.8	406861785.2	430502441.6	Calculated

[19] http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver5.zip

Net electricity import from SR (GWh)	2376.52	3252.49	0	CEA Database, Version 5.0
SR simple OM excl imports (tCO2/MWh)	0.999120924	0.990623514	0.970440656	CEA Database, Version 5.0
Absolute emissions from imports (tCO2)	2374430.858	3221993.074	0	Calculated
Absolute emissions incl imports (tCO2)	388067224.6	410083778.3	430502441.6	Calculated
Net generation incl imports (GWh)	384804.5178	410124.106	427699.7329	Calculated
Electricity import from other countries (GWh)	2957.4	5230.03	5897.1	Imported from Bhutan and exported to Nepal
Emission factor for imports from other countries (tCO2/MWh)	0	0	0	-
Absolute emissions from imports from other countries (tCO2)	0	0	0	Calculated
NEWNE Simple OM incl imports (tCO2/MWh)	1.008478868	0.99990167	1.006552982	Calculated
Weighted Generation Operating Margin	**1.004**			**Calculated**

Simple Operating Margin calculation has been done *ex-ante* and hence OM values will remain fixed and need not be monitored during the crediting period.

Step 5: Calculate the build margin emission factor:

The build margin emissions factor is the generation-weighted average emission factor (tCO_2e/MWh) of all power units during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = (\sum_m EG_{m,y} * EF_{EL,m,y}) / \sum_m EG_{m,y}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2e/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2e/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available.

Calculations for the Build Margin emission factor $EF_{grid,BM,y}$ is based on the most recent information available on the plants already built for sample group at the time of PDD submission. The sample group consists of the power plant capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently.

As per CEA CO_2 database, the latest available for the year 2008-09 is

Build Margin	Values	Source
2008 – 09	0.675 tCO_2e/MWh	CEA CO_2 Data base, Version 5

Step 6: Calculate the combined margin emission factor:

The combined margin is a weighted average of the simple operating margin and the build margin. The combined margin emissions factor is calculated as follows:

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

$EF_{grid,CM,y}$ = Combined margin 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 (%)

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

W_{BM} = Weighting of build margin emissions factor (%)

The default values used for biomass based power plants are W_{OM} =0.5 and W_{BM} =0.5

Hence the combined margin is calculated as follows:

$$\begin{aligned} EF_{grid,CM,y} &= EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM} \\ &= (0.5 * 1.004) + (0.5 * 0.675) \\ &= 0.84\ tCO_2/MWh \\ &= EF_{CO_2,grid,y} \end{aligned}$$

Combined Margin for the grid	Values	Source
	0.84 tCO_2e/MWh	Calculated

Project Emissions:

As per paragraph 19 of approved methodology AMS-I.D. (Version-16, EB- 54), for most renewable

energy project activities, $PE_y = 0$.

In case of our project activity, the project will be equipped with 1*250 kVA diesel generator set for emergency purposes. The quantity of diesel used in the plant will be monitored and the emissions due to the same would be considered as project emissions. However, for ex-ante purpose, the same is being considered as Zero. However, during the annual verification, the emissions would be calculated using the formula given below and deducted from the overall emission reductions.

The following equation as per "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion**"** is used to calculate the project emissions due to diesel consumption:

The CO_2 emissions from fossil fuel combustion (diesel) in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = FC_{i,j,y} * COEF_{,i,y}$$

$PE_{FC,j,y}$ = 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 (tCO2/mass or volume unit)

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

The CO_2 emission coefficient $COEF_{,i,y}$ can be calculated depending on the availability of data on the fossil fuel type i, as mentioned in the tool. As net calorific value and CO_2 emission factor of the fuel type i are the data available, the option B of the tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" is chosen for the calculation as described below,

The CO_2 emission coefficient $COEF_{,i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{,i,y} = EF_{CO2,i,y} * NCV_{i,y}$$

$EF_{CO2,i,y}$ = Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)

$NCV_{i,y}$ = Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)

Leakage Emissions:

As per paragraph 21 of the approved methodology AMS-I.D. (Version-16, EB- 54), if the energy generating equipment is transferred from another activity, leakage is to be considered. The leakage

emissions may be considered as zero as no such equipment shall be transferred from another project activity.

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).

However, paragraph 46d of EB 51 meeting report[20] clarifies that leakage emissions from transportation of biomass is to be considered significant (accounted for) only when biomass is transported over a distance of 200 km or more

The availability of biomass in the project region (radius of 50 km) is studied and the biomass surplus availability is ensured[21]. Hence, the project proponent does not require a situation where it may require transporting biomass over a distance of 200 km; consequently, leakage emissions on this account may also be neglected.

As per the project activity, there is an abundant surplus of biomass in the region of the project activity which is not utilized. Hence the leakage can be ruled out by demonstrating that 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). The study 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 cap of 25%.

Thus the leakage for the project activity is considered as zero. $LE_y = 0$.

Emission Reduction:

The emission reduction by the project activity during a given year y (ER_y) is the difference between the baseline emissions (BE_y) and project emissions (PE_y) and leakage emissions (LE_y), as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

[20] http://cdm.unfccc.int/EB/051/eb51rep.pdf

[21] Biomass Assessment Study (Page nos. : 22, 24, 28)

ER_y = are the total emissions reductions during the year y in tons of CO_2.

PE_y = are the emissions from the project activity during the year y in tons of CO_2.

BE_y = are the baseline emissions for the project activity during the year y in tons of CO_2.

LE_y = are the leakage during the year y in tons of CO_2.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2e/MWh
Description:	Operating Margin Emission factor of NEWNE grid
Source of data used:	CEA data, CO_2 Baseline Database, Version 5, http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver5.pdf
Value applied:	1.004
Justification of the choice of data or description of measurement methods and procedures actually applied :	The CO_2 database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the CEA and hence considered authentic. (Weighted average of three years: 2006-07, 2007-08, 2008-09 is considered.)
Any comment:	As the calculation of baseline emission has been done *ex ante* its value will remain fixed for the entire crediting period.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2e/MWh
Description:	Build Margin Emission factor of NEWNE grid
Source of data used:	CEA data, CO_2 Baseline Database, Version 5, http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver5.pdf
Value applied:	0.675
Justification of the choice of data or description of measurement methods and procedures actually applied :	The CO_2 database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the CEA and hence considered authentic. (BM for the year 2008-09 is considered)
Any comment:	As the calculation of baseline emission has been done *ex ante* its value will remain fixed for the entire crediting period.

Data / Parameter:	$SFC_{cotton\ stalk}$
Data unit:	kg/kWh
Description:	Specific consumption of Cotton stalk
Source of data used:	DPR
Value applied:	1.203
Justification of the choice of data or description of measurement methods and procedures actually applied :	The specific fuel consumption has been adopted from the value suggested in the DPR. (*Calculated based on net calorific value and station heat rate)*
Any comment:	The project proponent intends to use cotton stalk for power generation as it is the most abundant biomass available in surplus around the project site.

Data / Parameter:	$SFC_{mustard\ husk}$
Data unit:	kg/kWh
Description:	Specific consumption of Mustard husk
Source of data used:	DPR
Value applied:	1.308
Justification of the choice of data or description of measurement methods and procedures actually applied :	The specific fuel consumption has been adopted from the value suggested in the DPR. (*Calculated based on net calorific value and station heat rate)*
Any comment:	The project proponent intends to use mustard husk for power generation as it is the most abundant biomass available in surplus around the project site.

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of the fossil fuel (i) (diesel) combusted in project activity during the year y
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, Table 1.4
Value applied:	74.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value at the upper limit of the uncertainty at a 95% confidence interval is used.
Any comment:	Any future revision of the IPCC Guidelines shall be taken into account.

B.6.3 Ex-ante calculation of emission reductions:

Baseline Emissions:

As per paragraph 11 of the methodology AMS I D, Version 16, the baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

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

Where:

BE_y = Baseline Emissions in year y; tCO_2e

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

$EF_{CO,grid,y}$ = CO_2 emission factor of the grid in year y (tCO_2e/MWh)

Calculation of baseline emissions:

$$EG_{BL,y} = EG_{export,y} - EG_{import,y}$$

Where,

$EG_{export,y}$ = Electricity exported to the grid in the year y

$EG_{import,y}$ = Electricity imported from the grid in the year y

Particulars	Unit	Value
Capacity of the plant	MW	10
No of hours in a year	hrs	8,760
Plant load factor	%	80
Gross energy generation	MWh	70,080
Auxiliary consumption	%	12
Auxiliary energy consumption	MWh	8,410
Net energy generation/ Electricity exported to the grid	MWh	61,670
Electricity imported from the grid	MWh	0
Net Electricity supplied to the grid	MWh	61,670
Emission factor of NEWNE grid	tCO_2e/MWh	0.84
Baseline emission	tCO_2e/annum	51,803

Calculation of NEWNE grid emission factor:

Parameter	2006-7	2007-08	2008-09	Remarks
NEWNE Simple OM excl imports (tCO2/MWh)	1.016397044	1.012997158	1.020625307	CEA Database, Version 5.0
NEWNE Net Generation in OM (GWh)	379470.5978	401641.586	421802.6329	CEA Database, Version 5.0
NEWNE Aabsolute emissions in OM (tCO2)	385692793.8	406861785.2	430502441.6	Calculated
Net electricity import from SR (GWh)	2376.52	3252.49	0	CEA Database, Version 5.0
SR simple OM excl imports (tCO2/MWh)	0.999120924	0.990623514	0.970440656	CEA Database, Version 5.0
Absolute emissions from imports (tCO2)	2374430.858	3221993.074	0	Calculated
Absolute emissions incl imports (tCO2)	388067224.6	410083778.3	430502441.6	Calculated
Net generation incl imports (GWh)	384804.5178	410124.106	427699.7329	Calculated
Electricity import from other countries (GWh)	2957.4	5230.03	5897.1	Imported from Bhutan and exported to Nepal
Emission factor for imports from other countries (tCO2/MWh)	0	0	0	-
Absolute emissions from imports from other countries (tCO2)	0	0	0	Calculated
NEWNE Simple OM incl imports (tCO2/MWh)	1.008478868	0.99990167	1.006552982	Calculated
Weighted Generation Operating Margin	**1.004**			**Calculated**
Build Margin	**0.675**			**CEA Database,**

		Version 5.0
wOM	**0.5**	**Tools to calculate Emission Factor for an Electricity System**
wBM	**0.5**	
Combined Margin	**0.84**	**Calculated**

Project Emissions:

Project emissions due to diesel consumption:

The project activity will be equipped with 1*250 kVA diesel generator set for emergency purposes. The quantity of diesel used in the plant will be monitored and the emissions due to the same would be considered as project emissions. However, for ex-ante purpose, the same is being considered as Zero. However, during the annual verification, the emissions would be calculated using the formula given below and deducted from the overall emission reductions.

The following equation as per "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion**"** is used to calculate the project emissions due to diesel consumption:

The CO_2 emissions from fossil fuel combustion (diesel) in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = FC_{i,j,y} * COEF_{,i,y}$$

$PE_{FC,j,y}$ = 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 (tCO2/mass or volume unit)

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

The CO_2 emission coefficient $COEF_{,i,y}$ can be calculated depending on the availability of data on the fossil fuel type i, as mentioned in the tool. As net calorific value and CO_2 emission factor of the fuel type i are the data available, the option B of the tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" is chosen for the calculation as described below,

The CO_2 emission coefficient $COEF_{,i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{,i,y} = EF_{CO2,i,y} * NCV_{i,y}$$

$EF_{CO2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)

$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)

Calculation of Project Emission:

Particular	Unit	Value	Remarks
Quantity of diesel consumption in the project activity	Litres/annum	0	Diesel will be consumed only for emergency cases
Net Calorific Value of diesel	TJ/tonne	0.0433	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, Table 1.4
Emission factor of diesel	tCO_2/TJ	74.8	
Density of diesel	Kg/m^3	860	http://www.iocl.com/Products/DieselSpecifications.pdf
Project emission due to consumption of diesel	tCO_2e/annum	0	Calculated

Leakage Emissions:

As per paragraph 21 of the approved methodology AMS-I.D. (Version-16, EB- 54), if the energy generating equipment is transferred from 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.

Explained in details in Section: B.6.1

Thus the leakage for the project activity is considered as zero. $LE_y = 0$.

Emission Reduction:

The emission reduction by the project activity during a given year y (ER_y) is the difference between the baseline emissions (BE_y) and project emissions (PE_y) and leakage emissions (LE_y), as follows:

Parameter	Abbreviation	Unit	Value	Remarks
Baseline Emission per annum	BE_y	tCO_2e	**51,803**	Calculated
Project Emission per annum	PE_y	tCO_2e	**0**	Calculated
Leakage emissions per annum	LE_y	tCO_2e	**0**	Calculated

Emission Reduction	ER_y	**tCO_2e**	**51,803**	**Calculated**

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of Project activity Emissions (tCO_2e)	Estimation of Baseline Emissions (tCO_2e)	Estimation of Leakage (tCO_2e)	Estimation of overall emission Reductions (tCO_2e)
Year 1	0	51,803	0	51,803
Year 2	0	51,803	0	51,803
Year 3	0	51,803	0	51,803
Year 4	0	51,803	0	51,803
Year 5	0	51,803	0	51,803
Year 6	0	51,803	0	51,803
Year 7	0	51,803	0	51,803
Year 8	0	51,803	0	51,803
Year 9	0	51,803	0	51,803
Year 10	0	51,803	0	51,803
Total emission reduction (tCO_2e)	0	518,030	0	518,030

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{export,y}$
Data unit:	MWh
Description:	Electricity exported to the grid in the year y
Source of data to be used:	Joint meter reading records.
Value of data applied for the purpose of calculating expected emission reductions in section B.6	61,670 (Projected value)
Description of measurement methods and procedures to be applied:	Measured readings of the energy meter installed at the grid interconnection point. This will be recorded every month jointly by representative officials of SSEPPL and the grid/licensee. This record will be archived and stored.
QA/QC procedures to be	The "ABT" digital energy meter of standard make and accuracy (0.2)

applied:	and Identical check meters will be installed at the grid interconnection point. The energy meter readings will be monitored continuously, measured hourly and recorded monthly. In case the main meter becomes defective, the readings would be based on readings recorded on the check meter. The electricity exported will be cross verified against invoices raised by SSEPPL. The meter will be calibrated annually.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period. In case of failure of both main meter as well as check meter at a time, no emission reduction will be claimed for the period starting from the date of failure to the date of replacement.

Data / Parameter:	$EG_{import,y}$
Data unit:	MWh
Description:	Electricity imported from the grid in the year y
Source of data to be used:	Joint meter reading records.
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0 (Projected value)
Description of measurement methods and procedures to be applied:	Measured readings of the energy meter installed at the grid interconnection point. This will be recorded every month jointly by representative officials of SSEPPL and the grid/licensee and will be archived and stored.
QA/QC procedures to be applied:	The "ABT" digital energy meter of standard make and accuracy (0.2) and Identical check meters will be installed at the grid interconnection point. The energy meter readings will be monitored continuously, measured hourly and recorded monthly. In case the main meter becomes defective, the readings would be based on readings recorded on the check meter. The electricity exported will be cross verified against bills received from Electricity Board. The meter will be calibrated annually.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh
Description:	Net Electricity supplied to the grid in the year y
Source of data to be used:	Calculated based on energy meter reading of electricity export and electricity import Net Electricity supplied to the grid in the year y = (Electricity exported to the grid in the year y) - (Electricity imported from the grid in the year y)

	$= EG_{export,y} - EG_{import,y}$
Value of data applied for the purpose of calculating expected emission reductions in section B.6	61,670 (Projected value)
Description of measurement methods and procedures to be applied:	This is the major parameter for calculation of emission reductions and will be based on readings of the main energy meter installed (which is calculated as the difference between the measured quantities of the electricity export and the import).
QA/QC procedures to be applied:	This will be calculated as the difference of the electricity exported and the electricity imported as monitored above. The energy meter readings will be monitored continuously, measured hourly and recorded monthly. These readings can be cross checked based on bills invoices raised by SSEPPL. 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.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	Quantity of biomass $fuel_{cotton\ stalk}$
Data unit:	Tonnes/year
Description:	The quantity of biomass fuel cotton stalk used for electricity generation
Source of data to be used:	Data from Plant log books
Value of data applied for the purpose of calculating expected emission reductions in section B.6	42,162
Description of measurement methods and procedures to be applied:	The biomass is brought from outside the project boundary in trucks. Weighbridge is used to measure the load in each truck. Each truck that enters the site will be recorded at the weighbridge installed at the factory and after unloading the biomass the empty truck will again be weighed in the weigh bridge to arrive at net quantity of biomass purchased. The readings will be recorded in the logbooks and an annual mass balance that is based on purchased quantities, opening and closing stock will be performed. Monitoring : Continuously Recording : Daily -
QA/QC procedures to be applied:	The data recorded will be cross checked against purchase receipts and inventory records. And an annual mass balance that is based on purchased quantities, opening and closing stock will be performed. This can be cross checked with the balance stock to monitor the amount of biomass procured and combusted. The weigh bridge (with accuracy class III) will undergo calibration as per statutory norms of Weights and Measures Act on annual basis.

Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	Quantity of biomass $fuel_{mustard\ husk}$
Data unit:	Tonnes/year
Description:	The quantity of biomass fuel mustard husk used for electricity generation
Source of data to be used:	Data from Plant log books
Value of data applied for the purpose of calculating expected emission reductions in section B.6	45,839
Description of measurement methods and procedures to be applied:	The biomass is brought from outside the project boundary in trucks. Weighbridge is used to measure the load in each truck. Each truck that enters the site will be recorded at the weighbridge installed at the factory and after unloading the biomass the empty truck will again be weighed in the weigh bridge to arrive at net quantity of biomass purchased. The readings will be recorded in the logbooks and an annual mass balance that is based on purchased quantities, opening and closing stock will be performed. Monitoring : Continuously Recording : Daily
QA/QC procedures to be applied:	The data recorded will be cross checked against purchase receipts and inventory records. And an annual mass balance that is based on purchased quantities, opening and closing stock will be performed. This can also be cross checked with the balance stock to monitor the amount of biomass procured and combusted The weigh bridge (with accuracy class III) will undergo calibration as per statutory norms of Weights and Measures Act on annual basis.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	Quantity of biomass $fuel_j$ (other than cotton stalk and mustard husk)
Data unit:	Tonnes/year
Description:	The quantity of biomass fuel (other than cotton stalk and mustard husk) used for electricity generation
Source of data to be used:	Data from Plant log books
Value of data applied for the purpose of calculating expected emission reductions in section B.6	-
Description of measurement methods and procedures to be	The biomass is brought from outside the project boundary in trucks. Weighbridge is used to measure the load in each truck. Each truck that enters the site will be recorded at the weighbridge installed at the factory

applied:	and after unloading the biomass the empty truck will again be weighed in the weigh bridge to arrive at net quantity of biomass purchased. The readings will be recorded in the logbooks and an annual mass balance that is based on purchased quantities, opening and closing stock will be performed. Monitoring : Continuously Recording : Daily
QA/QC procedures to be applied:	The data recorded will be cross checked against purchase receipts and inventory records. And an annual mass balance that is based on purchased quantities, opening and closing stock will be performed This can also be cross checked with the balance stock to monitor the amount of biomass procured and combusted. The weigh bridge (with accuracy class III) will undergo calibration as per statutory norms of Weights and Measures Act on annual basis.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	Moisture content of $biomass_{cotton\ stalk}$
Data unit:	Percentage
Description:	Moisture content of cotton stalk
Source of data to be used:	Laboratory log book
Value of data applied for the purpose of calculating expected emission reductions in section B.6	5.76
Description of measurement methods and procedures to be applied:	Sample of the biomass (cotton stalk) will be analysed for moisture content in the onsite laboratory for each truck load. The weighted average should be calculated for each monitoring period and used in the calculations.
QA/QC procedures to be applied:	Moisture content will be tested for every load of biomass procured from farmers / biomass traders. Weighing balance, standard weights and oven used for this purpose will be calibrated at least once in every three years. The lab log book records can be cross checked.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	Moisture content of $biomass_{mustard\ husk}$
Data unit:	Percentage
Description:	Moisture content of mustard husk
Source of data to be used:	Laboratory log book
Value of data applied for the purpose of calculating expected emission reductions	10

in section B.6	
Description of measurement methods and procedures to be applied:	Sample of the biomass (mustard husk) will be analysed for moisture content in the onsite laboratory for each truck load. Weighing balance, standard weights and oven used for this purpose will be calibrated at least once in every three years. The weighted average should be calculated for each monitoring period and used in the calculations.
QA/QC procedures to be applied:	Moisture content will be tested for every load of biomass procured from farmers / biomass traders. The lab log book records can be cross checked.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	Moisture content of $biomass_j$ (other than cotton stalk and mustard husk)
Data unit:	Percentage
Description:	Moisture content biomass (other than cotton stalk and mustard husk)
Source of data to be used:	Laboratory log book
Value of data applied for the purpose of calculating expected emission reductions in section B.6	-
Description of measurement methods and procedures to be applied:	Sample of the biomass (other than cotton stalk and mustard husk) will be analysed for moisture content in the onsite laboratory for each truck load. The weighted average should be calculated for each monitoring period and used in the calculations.
QA/QC procedures to be applied:	Moisture content will be tested continuously for every load of biomass procured from farmers / biomass traders. Weighing balance, standard weights and oven used for this purpose will be calibrated at least once in every three years. The lab log book records can be cross checked.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	$NCV_{cotton\ stalk}$
Data unit:	Kcal/kg
Description:	Net calorific value of cotton stalk
Source of data to be used:	Laboratory log book
Value of data applied for the purpose of calculating expected emission reductions in section B.6	3,690
Description of measurement methods and procedures to be applied:	Sample of the biomass (cotton stalk) will be analysed using bomb calorimeter for GCV, in the onsite laboratory on annual basis. NCV will be calculated based on GCV.

QA/QC procedures to be applied:	The bomb calorimeter with an accuracy of RSD≤ 0.1% will be calibrated once in every three year. The net calorific value can be cross checked with lab log books. The consistency of the measurements can also be checked by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, additional measurements will be conducted.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	$NCV_{mustard\ husk}$
Data unit:	Kcal/kg
Description:	Net calorific value of mustard husk
Source of data to be used:	Laboratory log books
Value of data applied for the purpose of calculating expected emission reductions in section B.6	3,394
Description of measurement methods and procedures to be applied:	Sample of the biomass (mustard husk) will be analysed using bomb calorimeter for GCV, in the onsite laboratory on annual basis. NCV will be calculated based on GCV.
QA/QC procedures to be applied:	The bomb calorimeter, with an accuracy of RSD≤ 0.1%, shall be calibrated once in every three year. The net calorific value can be cross checked with this lab log books. The consistency of the measurements can also be checked by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, additional measurements will be conducted.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	$NCV_{i,j}$
Data unit:	Kcal/kg
Description:	Net calorific value of biomass (other than cotton stalk and mustard husk)
Source of data to be used:	Laboratory log books
Value of data applied for the purpose of calculating expected emission reductions in section B.6	-

Description of measurement methods and procedures to be applied:	The project proponent will arrange third party lab to test the NCV before first time use of any type of biomass (other than cotton stalk and mustard husk) in the boiler. Afterwards sample of the biomass (other than cotton stalk and mustard husk) will be analysed using bomb calorimeter for GCV, in the onsite laboratory on annual basis. NCV will be calculated based on GCV.
QA/QC procedures to be applied:	The bomb calorimeter, with an accuracy of RSD≤ 0.1%, shall be calibrated once in every three year. The net calorific value can be cross checked with lab log books. The consistency of the measurements can also be checked by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, additional measurements can be conducted.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	$FC_{i,y}$
Data unit:	Litres/annum
Description:	Quantity of fossil fuel consumption(diesel) in project activity in a year
Source of data to be used:	Log book maintained to record onsite consumption of diesel.
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0
Description of measurement methods and procedures to be applied:	Diesel procurement data will be monitored continuously and aggregated monthly. The total quantity of diesel purchased and the difference between the closing and opening stock will be considered as quantity of fossil fuel consumed in the project activity.
QA/QC procedures to be applied:	The diesel procurement data can be cross-checked with the diesel purchase invoices.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	$NCV_{i,y}$
Data unit:	TJ/tonne
Description:	Net calorific value of the fossil fuel (i) (diesel) combusted in the project activity during the year y.
Source of data to be used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2,Chapter 1, Table 1.2
Value of data applied for the purpose of calculating expected emission reductions	0.0433

in section B.6	
Description of measurement methods and procedures to be applied:	The net calorific value of diesel has been sourced from IPCC 2006 default value at the upper limit of the uncertainty at a 95% confidence interval and any future revision of the IPCC guidelines will be taken into account in determining the same.
QA/QC procedures to be applied:	Project participants have no control on the parameter. Hence, No QA/QC procedures are applicable.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

Data / Parameter:	ρ_{diesel}
Data unit:	kg/m^3
Description:	Density of fossil fuel diesel combusted in the project activity
Source of data to be used:	Regional values – http://www.iocl.com/products/dieselspecifications.pdf
Value of data applied for the purpose of calculating expected emission reductions in section B.6	860
Description of measurement methods and procedures to be applied:	The value of the density of the diesel has been taken based on regional values available. The most conservative value has been chosen from the range. The density of the fuel will be checked from the above source of data for each fuel delivery, from which weighted average annual values should be calculated.
QA/QC procedures to be applied:	Not applicable.
Any comment:	The data will be archived electronically and the archived data will be kept for 2 years beyond the Crediting Period.

B.7.2 Description of the monitoring plan:

The applicable simplified baseline and monitoring methodology for selected small scale CDM project activities AMS I.D. version 16 requires monitoring of the following:

The project proponent has a well defined project management structure for monitoring the project activity. The monitoring plan describes the operation and management structure, parameters and variables, monitoring practices, QA and QC procedures, data storage and archiving etc.

Monitoring parameters:

The following parameters will be monitored in the project activity:

1. Electricity export
2. Electricity import
3. Net electricity generation.
4. Quantity of biomass fuel (Cotton stalk ,Mustard husk and other biomass)
5. Net calorific value of biomass fuel (Cotton stalk Mustard husk and other biomass)
6. Moisture content of biomass fuel (Cotton stalk Mustard husk and other biomass)
7. Quantity of fossil fuel (diesel) consumption
8. Net calorific value of diesel
9. Density of diesel

Metering of electricity generation:

The "ABT" digital energy meter of standard make and accuracy (0.2) and identical check meters will be installed at the grid interconnection point. The monitoring will be done on continuous basis.

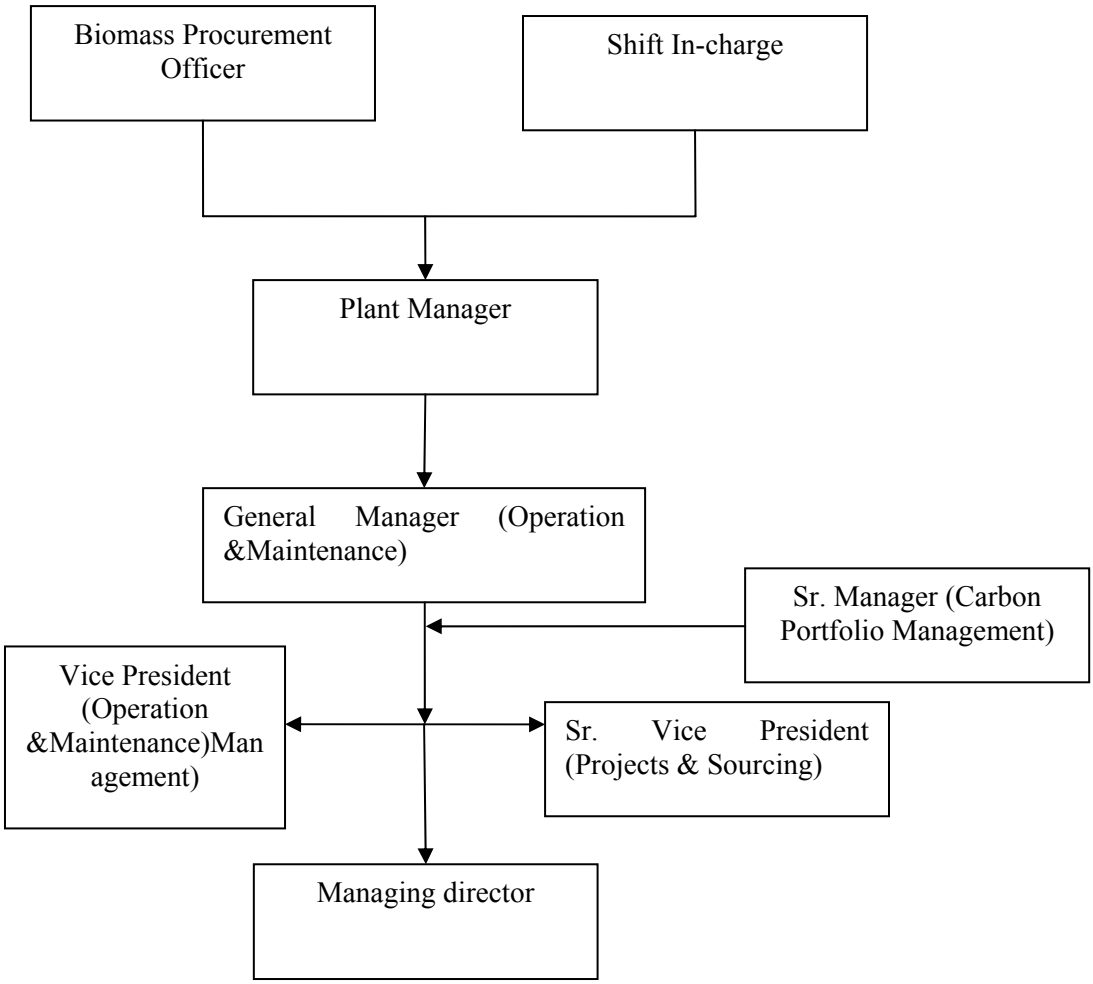
Calibration/QA-QC procedures:

The energy meter will be calibrated on an annual basis by the state nodal agency. In case of any failure in the main meter it would be replaced or calibrated immediately and for that time being check meter reading would be used for emission reduction estimation. In case the main meters are found to operate outside the permissible limits of error (0.2%), the meter shall be immediately calibrated and the error that is identified in the calibration would be applied to entire range of data from the date of last calibration. Similarly in case of any failure in the check meter it would be replaced or calibrated immediately. In case of failure of both the meters at a time no emission reduction will be claimed for the period starting from the date of failure to the date of replacement.
Other measuring equipment like bomb calorimeter (used for NCV analysis), standard weights, weighing balance and oven (used for moisture analysis) shall be calibrated by accredited third party once in every three years and calibration records shall be maintained. The bomb calorimeter shall be having an accuracy of RSD≤ 0.1%.

Data Collection and Archiving:

The monthly data of electricity generation is collected in both log book and electronic form. However, the data in electronic form is archived throughout the life time of the project. The electricity records are maintained regularly by the team at the site. Other data variables that are most directly related to the emission reductions are collected and archived electronically. The archived data will be kept for 2 years beyond the Crediting Period.

The following chart shows the data flow for the monitored data for the project activity.



The table below shows the roles and responsibilities and the information flow for the project activity data.

Personnel	Responsibility

Biomass Procurement Officer	Biomass Procurement Officer is responsible for continuous monitoring of biomass procurement for project activity. He will be responsible for continuous supply of biomass to meet the daily requirement without any shortage. The daily procurement with type of biomass purchased will be maintained in the site.
Shift In charge	Shift in charge will monitor the plant parameters including the monitoring parameters as described in the PDD. He will collect the data recorded in log sheets of respective sections and prepare the consolidated report on electricity generation, export to grid, fuel consumption, plant shut down time, etc. for every shift.
Plant Manager	Plant Manager is responsible for the overall plant performance and electricity generation of the power plant. He would cross check and sign the daily plant operation reports regularly, and report to General Manager (Operation & Maintenance) for any abnormality. The periodical tests of the monitoring equipments would be looked after by him as per the monitoring plan. The responsibility of storage and archiving of information in good condition also lies with the Plant Manager. He would also co-ordinate to obtain audit reports as per the monitoring plan from Internal auditors.
General Manager (Operation & Maintenance)	General Manager (Operation & Maintenance) will check the generation reports and correct if there is any abnormalities in the power plant. He will also have review meetings periodically with Plant Manager to improve the Plant Performance. He will submit the report to Vice President (Operation & Maintenance)
Sr. Manager (Carbon Portfolio Management)	Sr. Manager (Carbon Portfolio Management) is responsible for the overall CDM activities. He will discuss with plant manager and will be responsible for proper monitoring of data's as mentioned in monitoring plan. He will be reporting to Senior Vice-President (Projects & Sourcing) has to look after the CDM validation / verification process for the project activity.
Vice- President (Operation & Maintenance)	Vice- President (Operation & Maintenance) is responsible for the total monitoring plan. Vice- President will examine the reports generated by Plant Manager / General Manager (Operation & Maintenance) with reference to the monthly electricity generated; net electricity exported to grid. He also examines the internal audit reports prepared by Plant Manager and will in particular take note of any deviations in data over the norms and monitor that the corrective actions have resulted in adherence to standards. He would cross check plant operation reports regularly, and report to Managing Director for any abnormality.

Senior Vice-President (Projects & Sourcing)	Senior Vice - President will coordinate the overall CDM activities and check the final monitoring report. He will cross check the data mentioned in the final monitoring report with the reports generated by Operation & Maintenance team. He will submit the final report to the Managing Director.
Managing Director	Managing Director will review the reports regularly and take necessary corrective action, if necessary.

Monitoring Report:

Every year the project promoter will prepare a monitoring report showing all emission reduction calculations as per monitoring plan**.**

The monitoring report will be compiled annually. This report will contain:

- A summary of the emission reductions achieved;
- Data of the electricity generated and other data variables that are most directly related to the emission reductions in the Project Activity;
- The required records of calibration and maintenance of measuring devices;

It will be submitted at the end of each monitoring period.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completion : 03/02/2011

Name and contact details : First Climate (India) Pvt. Ltd.
3C, Camac Street,
Camac Tower, 9th floor,
Kolkata – 700 016, India.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

The date of the purchase order of the equipment for the proposed CDM project has been considered as the start date of the project:

The start date as per LOI for the boiler is **16/06/2008**

C.1.2. Expected operational lifetime of the project activity:

20 Years 0 Months[22]

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

C.2.1. Renewable crediting period

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

N.A

C.2.1.2. Length of the first crediting period:

N.A

C.2.2. Fixed crediting period:

Yes

C.2.2.1. Starting date:

From the date of registration or 31/01/2012, whichever is later.

C.2.2.2. Length:

10 Years 0 Months

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The proposed project activity is a biomass based power project. This category of projects does not require an environmental impact analysis to be performed under the existing national and regional laws of the host party (India).

[22] http://www.rerc.gov.in/index1.htm

MoEF, Government of India notification, dated December 01,2009[23] , regarding the requirement of Environment Impact Assessment (EIA) studies states that any project developer in India needs to file an application to the MoEF (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list. Thirty-eight categories of activity with a certain investment criteria are required to undertake an EIA.

However, the proposed project doesn't fall under the list of activities requiring EIA as it will not involve any negative environmental impacts.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

N/A

[23] http://moef.nic.in/downloads/rules-and-regulations/3067.pdf

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The stakeholder meeting was organized by the project proponent SSEPPL on 19th Oct 2010 to inform the local people on the environmental and social impacts of the project activity and to understand their concerns, if any, regarding the project activity. The invitation letter for the stakeholder meeting was prepared and sent out in advance to the local villagers, Gram Panchayat members and to the representatives of SSEPPL. An Advertisement in newspaper was also given regarding the Stakeholder consultation meeting on the local newspaper named "Rajasthan Patrika and Dainik Bhaskar which was published on 14th Oct 2010.

SSEPPL, the project proponent of 10 MW biomass based power project conducted the Stakeholder meeting at project site on 19th October 2010 at 10:00 AM to ascertain the views of the stakeholders regarding setting up of the biomass based power plant.

Representative of Village

- ✓ Mr. Brij Mohan Bhadu

Representatives of Project proponent

- ✓ Mr. R. Kulothungan
- ✓ Mr. Prahalad Singh
- ✓ Mr. Sachin Maheswari
- ✓ Mr. R. Mohanakrishnan

Others

- ✓ Mr. Ram Kishan Songara, D S P, Sangaria
- ✓ Mr. Sanjay Kumar, Shriram EPC

Mr. Sachin Maheswari initiated the meeting by welcoming all the stakeholders to the meeting. He explained in detail about the proposed 10 MW Biomass based Power Project, biomass availability in the surrounding area. The project activity will generate direct and indirect employment opportunities to the local people during construction and operation of power plant. He also explained about clean development mechanism and how usage of biomass for power generation will contribute to well being of our environment. Thanking once again to all the stakeholders for attending the meeting, Mr. Sachin Maheswari invited Mr. Prahalad Singh to speak few words about the project activity

Mr. Prahalad Singh briefed about the project activity and its basic objective of generating power by using biomass. He also indicated that agriculture residues will be used for power generation and farmers in the local area will be benefitted by the project activity. He thanked all the stakeholders for attending the

meeting. Mr. Sachin Maheswari thanked Mr. Prahalad Singh and invited Mr. Ram Kishan Songara to speak few words about the project activity.

Mr. Ram Kishan Songara thanked SSEPPL for inviting him to the meeting. He appreciated SSEPPL initiative for using agriculture waste for power generation. Mr. Sachin Maheswari thanked Mr. Ram Kishan Songara and invited Mr. Sanjay Kumar to speak few words about the project activity. Mr. Sanjay kumar explained about the technical details of the proposed biomass based power plant and advantages of the biomass based power project. Mr. Sachin Maheswari thanked Mr. Sanjay Kumar.

After the interactive session Mr. Mohanakrishnan thanked all the stakeholders for attending the meeting and concluded the meeting.

E.2. Summary of the comments received:

The participants provided their feedback on the initiative taken up by the project promoter. The stakeholder Mr.Vinay Kumar srivatsav raised a question on what type of biomass will be used for power generation and Mr. Sachin Maheswari replied him that renewable biomass cotton stalk and mustard husk will be used for power generation. The stakeholders expressed their goodwill for the environment friendly initiative. The stakeholders agreed that the project activity is helpful in the socio-economic upliftment of the people in the neighbouring area. The stakeholders also supported the project as they believe the project is environmentally sound and it would lead to an overall development of the area by generating employment, improving infrastructure and other commodities. The local village people unanimously agreed that due to this project activity the employment opportunities for the local people have increased to some extent. And also the business opportunities had been increased. Also, no negative comments were received.

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

The participants had raised questions related and the questions were satisfactorily explained to the participants. The project promoter explained about the technical details, feasibility of the project activity and its impacts on environment. Considering the comments made by the stakeholders, no significant negative impacts due to the project activity had been identified.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sanjog Sugars & Eco -Power Private Limited
Street/P.O.Box:	Rukmani Lakshmipathi Road (Marshalls Road), Egmore
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E-Mail:	krishnakumar@orientgreenpower.com
URL:	www.orientgreenpower.com
Represented by:	Mr. P. Krishnakumar
Title:	Director
Salutation:	Mr
Last Name:	P
Middle Name:	-
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Department:	-
Mobile:	+91 9884089646
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Direct tel:	+91 – 44 – 49015678
Personal E-Mail:	Krishnakumar.peekaay@gmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the project activity.

Annex 3

BASELINE INFORMATION

Refer to Section B.4

Annex 4

MONITORING INFORMATION

Refer to Section B.7- - - - -