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

Title: Biomass Based Power Project at Raipur

Version: 01

Date: 20/10/2011

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

Shanti G.D. Ispat & Power Private Limited (SGDPL). is in the process of setting up a 15 MW Biomass based power generation unit at Janjgir Village in Champa District in the state of Chhattisgarh, India. This is a Greenfield project.

The purpose of the project is the construction and operation of a grid connected electricity generation unit using biomass (renewable source). The biomass project generation facility will involve installation of a 70 TPH nominal capacity Fluidized Bed Combustion Boiler. The boiler and the turbo-generator will be installed with the necessary auxiliary plants and systems required for the efficient operation of the biomass based power plant.

The power generation at 11 kv from the plant shall be stepped upto 33/132 kv level and connected to CSEB Grid, which is a part of NEWNE grid (Integrated Northern, Eastern, Western, and North-Eastern regional grids) system in place of what would otherwise be a mix of sources consisting predominantly of fossil fuel based).

By implementing this project activity, which has a capacity of 15MW, SGDIPL would help mitigate and marginally displace carbon intensive GHG emissions from the southern grid, and help conserve nonrenewable fossil fuels. The project brings in local as well as global environmental benefits and also contributes to socio-economic development. The project participant lists below the various aspects of the project activity under each sustainable development indicator as required by the host country:

Social well being:

- The project would generate employment for the deprived segment of the society at the rural level (which is a major concern in India) for collection, processing and supply of the biomass fuels envisaged.
- Create jobs for operating the plant as well for fuel collection system, transportation of fuel material to the project plant from sources.
- The generation of eco-friendly green power and contribution to the availability of quality power in the rural area where the plant is located which brings about socio economic development of rural.

Economic well being:

- Employment generation for the local population which results in economic well being.
- Generation of additional income for rural farmers due to creation of commercial value for the neglected biomass in and around the project region would bring in additional investment consistent with the needs of the people.

Environmental well being:

- The project activity utilises biomass potential available for power generation, which otherwise is dominated by fossil fuels such as coal, lignite and gas.
- The project contributes to climate change mitigation, through renewable energy generation and reducing the demand for fossil fuel based power.

Technological well being:

- The technology of use of biomass mater is still not preferred in comparison to coal in India today. The success of the project will help in sharing of the technology to the other power producers and would also promote the generation of green power in the region. Dissemination of this project will improve technological scenario and thus contribute to technological growth related to the use of biomass fuels for power generation in the state of Chhattisgarh.

A.3. Project participants:

Name of the 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 (Yes/No)

India	Shanti G.D. Ispat & Power Private Limited	No

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

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

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A.4.1.1. Host Party(ies):

India

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

State: Chattisgarh

A.4.1.3. City/Town/Community etc:

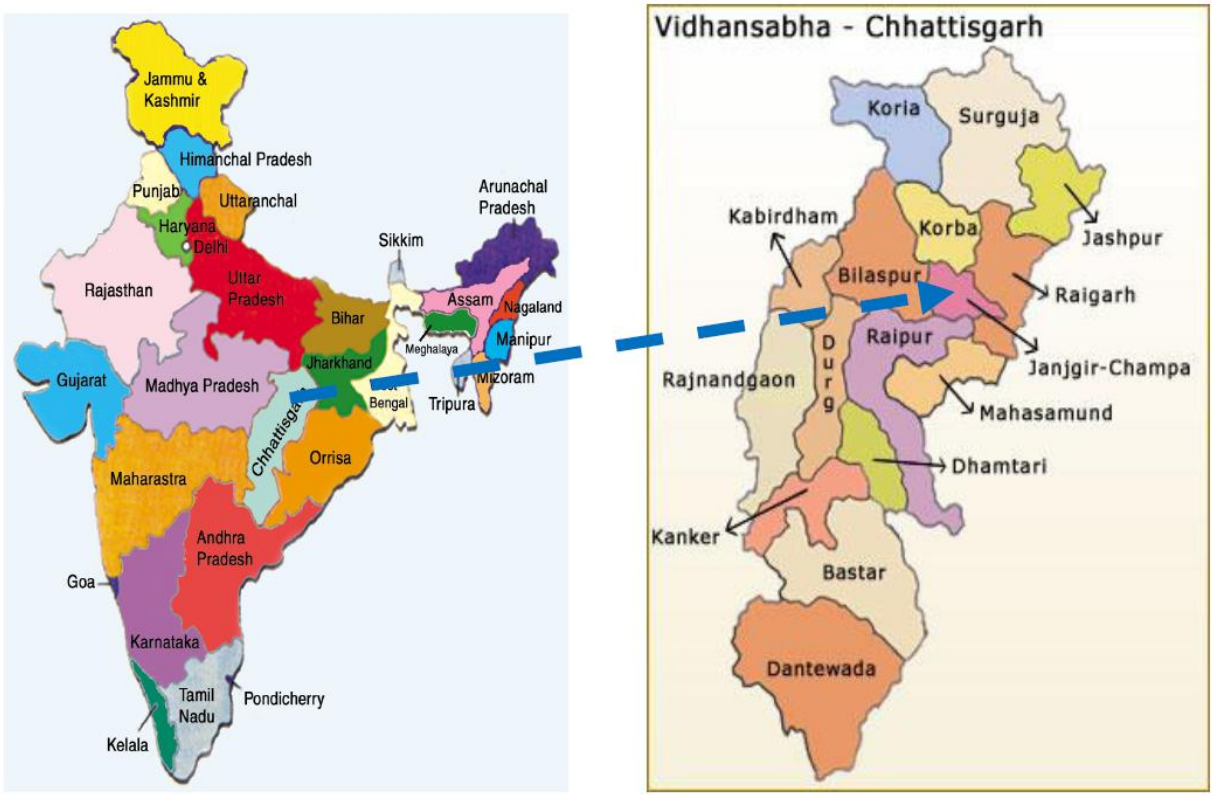
Village: Mahuda

District: Janjgir-Champa

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

The site is located at village Mahuda District: Janjgir-Champa in Chhattisgarh State around 3 kms from Champa City. The nearest railway stations is Balpur on Korba- Champa Railwayline of SECR, which is 0.5 kms away from this site. The site is nearly 1 KM away from state highway passing from Champa to Korba. The nearest airport is located at Raipur which is situated around 200 Km from the plant location.

The geographical location of the place is as follows: $22^0$05'N and: $82^0$39'E.



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

Type and category:

Using the categorization of Appendix B to the simplified modalities and procedures for small-scale CDM project activities, this project activity falls under:

Type I – Renewable energy projects as this is a renewable biomass based power project;

Category D – Electricity generation for a system as the generated electricity will be exported to the grid.

Hence, the approved small scale methodology that will be applicable to this project activity is AMS I.D/version 17.

Reference: http://cdm.unfccc.int/methodologies/SSCmethodologies

Technology Description:

The plant machinery of the project activity consists of one number multi-fuel fired boiler, one number steam turbo-generator, power evacuation system and fuel handling system. The basic technology is direct combustion of biomass residues in the multi-fuel fired boiler to generate high pressure and high temperature steam, which drives a steam turbine generator set thereby converting heat energy to

electrical energy. The electricity voltage level generated by the turbo generator, is stepped to the voltage that is suitable to interface with the grid electricity for evacuation. Other equipment of plant includes ash handling system, power distribution facilities, cooling tower system, etc. The technology of power generation through direct combustion of fuels is already established in India, but this is the case of application of an established technology in a region newly or currently. The capacity of the turbo generator set is of 15000 kW/ 15 MW of which generates electricity at a voltage level of 11 kV, the gross generation of power at alternator terminals will be 15000 kW. Out of this around 10% of gross electricity generated will be consumed by the plant auxiliary equipments and balance power be export to grid. Therefore, the technology is environmentally safe and sound.

The generated electricity is fed to the NEWNE grid (Integrated Northern, Eastern, Western, and North-Eastern regional grids) system through a 33/11 kV Sub-Station located at Bilayatkalan about 1.5 km from the project site and the above have been summarized in the tabular form as shown below:

A key technical specification of the major equipments for the project is as given in the below table:

Boiler	
Type	Multi fuel fired, Fluidized Bed Combustion Boiler
No. of boilers	1
Boiler capacity/steam flow rate	70 TPH
Steam pressure at super heater outlet	88 Kg/Cm^2
Steam temperature at super heater outlet	520^0C +/- 5%
Turbo-Generator	
Type	Extraction cum condensing
Capacity	15 MW
Steam parameter at TG inlet	64 Kg/Cm^2
Steam temperature at TG inlet	495^0C +/- 5%
Generator Voltage	11 KV
Frequency	50 Hz
RPM	3000
Power factor	0.8

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

Years	Annual estimation of emission reduction in tonnes of CO_2
01/09/2012-31/08/2013	63475
01/09/2013-31/08/2014	63475
01/09/2014-31/08/2015	63475
01/09/2015-31/08/2016	63475
01/09/2016-31/08/2017	63475
01/09/2017-31/08/2018	63475
01/09/2018-31/08/2019	63475
01/09/2019-31/08/2020	63475
01/09/2020-31/08/2021	63475
01/09/2021-31/08/2022	63475
Total estimated reductions (**tonnes of CO_2**)	**634750**
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period (**tonnes of CO_2e**)	63475

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

No public funding from parties included in Annex I to the Kyoto Protocol is available to the project activity.

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

According to paragraph 2 of Appendix C to the simplified modalities and procedures for small scale CDM project activities, 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 project activity:

(a) With the same project participants;

(b) In the same project category and technology/measure; and

(c) Registered within the previous two years; and

(d) Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The project activity is not a debundled component of a larger project activity, since the project participant has neither registered nor submitted a request for registration of CDM project activity in the same project category and technology/measure within 1km of the present activity in last two years.

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:

Type: I - RENEWABLE ENERGY PROJECTS

Title: Grid connected renewable electricity generation.

Reference: Approved Small Scale methodology AMS-I.D. Version 17, EB 61.

Methodological Tools:

- "Tool to calculate the emission factor for an electricity system" (Version 02.2.0)

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

Since the project activity generates power from renewable sources (biomass) as fuel, and exports the power to the grid, the most suitable methodology would be "Grid Connected Renewable Electricity Generation" – AMS I.D version 17.

Applicability of the methodology	Justification of project activity to AMS I.D
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable	The project activity comprises renewable source (biomass) for electricity generation. Electricity generation, after supplying to the

biomass: *(a) Supplying electricity to a national or a regional grid.* *(b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual agreement such as wheeling*	auxiliary consumption of the plant, is sent to the regional grid, which is a part of the NEWNE Grid. Therefore, the project activity satisfies this applicability criterion of the methodology.
Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A2) applies is included in Table 2.	The project activity would supply electricity to the NEWNE grid. The first point of table 2 which says that the "project supplies electricity to a national/regional grid" is applicable for the project activity.
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 of (an) existing plant(s)2; or (d) involve a replacement3 of (an) existing plant(s).	This project activity involves the installation of a new biomass fired power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant). Therefore, the project activity satisfies this applicability criterion of the methodology.
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*	Project activity doesn't involve installation of hydro power plant. It is an installation of a new grid connected 15 MW biomass based power project. This criterion is not applicable for the

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

[2] 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.

[3] 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.

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.*	project activity under consideration.
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 fuel4, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity involves co-firing of both biomass and coal for the purpose of generation of power. Both biomass and coal are fired in the same AFBC boiler and the gross electricity generated of the entire unit adds up to 15 MW. Therefore, the project activity satisfies this applicability criterion of the methodology.
Combined heat and power (co-generation) systems are *not eligible under this category.*	The project activity is not a combined heat and power (cogeneration) system.
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 distinct5 from the existing units.	Project activity is not a capacity addition to an existing facility.
In the case of retrofit or replacement, to qualify as	No retrofitting or modification takes place in the

[4] A co-fired system uses both fossil and renewable fuels.

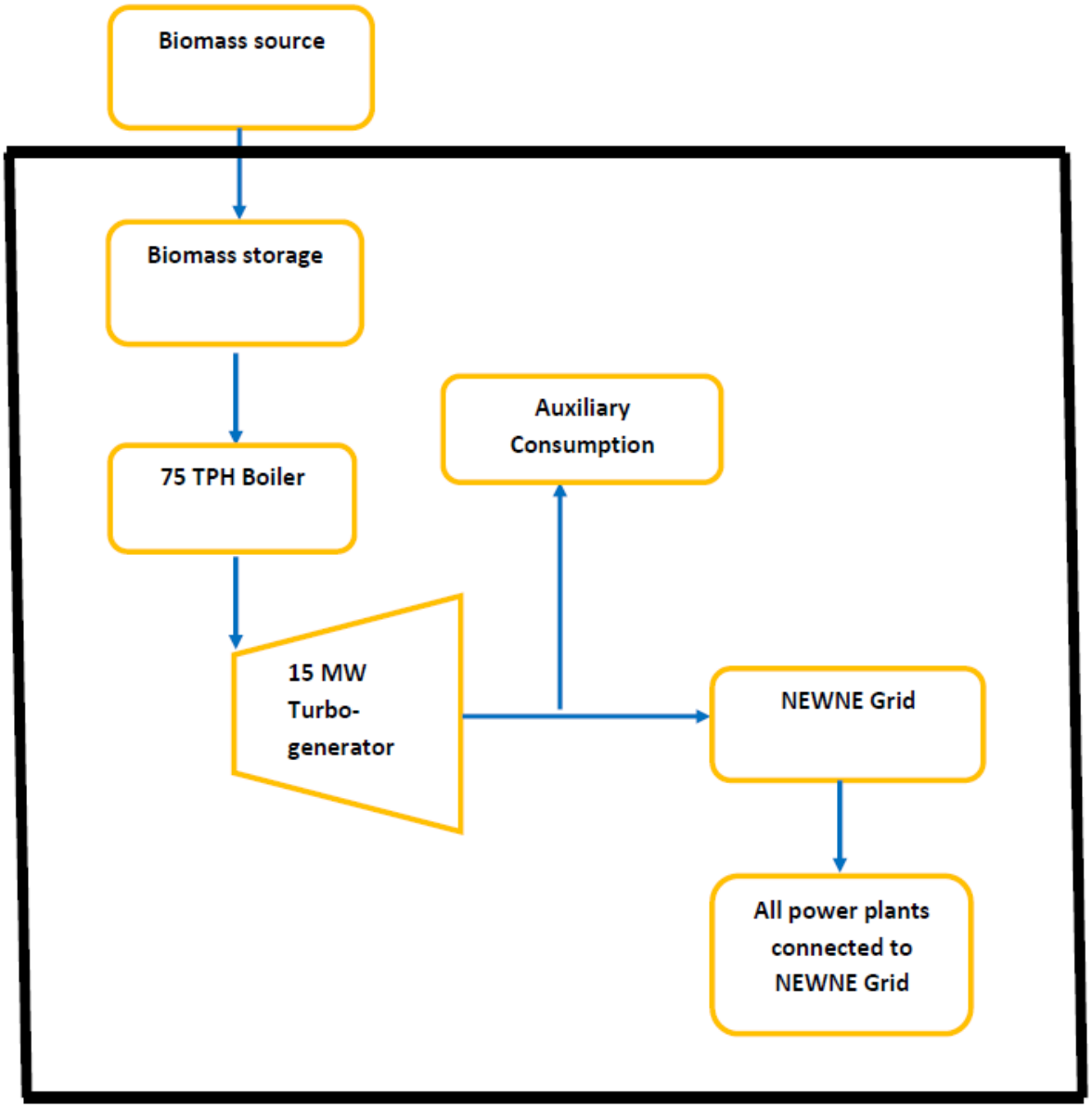
[5] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion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

a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	project activity.

The project activity thus meets all the applicability conditions for applying the methodology AMS-I.D/Version 17. Hence, it is justified that the project participant is following the guidelines of the above said methodology.

B.3. Description of the project boundary:

According to the guidance of the methodology AMS-I.D/version 17, the project boundary involves "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to".



Represents the project boundary:

The project boundary includes the entire power plant site including all machinery & equipments required for power generation in this plant and biomass storage area. It also contains all the power plants which are physically connected to the NEWNE Grid system, of which the project plant will also be a part. Project boundary is illustrated in the following above diagram.

B.4. Description of baseline and its development:

According to the guidance of the methodology AMS-I.D/Version 17,

"*The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid*."

In the absence of the project activity, the electricity demand would have been met by the operation of grid connected power plants which is dominated by fossil fuel fired power plants. Hence, the baseline for the project activity is the equivalent amount of power from the NEWNE grid.

According to the guidance of the methodology AMS-I.D/Version 17,

"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."

$$BE_y = EG_{BL,y} \times EF_{CO2,grid,y}$$

Where,

BE_y = Baseline Emissions in year y (t CO_2)

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

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

As per paragraph 12 of the methodology AMS-ID/version 17, "*The Emission Factor can be calculated in a transparent and conservative manner as follows*:"

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

OR

(b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

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

In the project plant the energy generated from the project activity is evacuated to the regional electricity grid. The baseline grid for the project is thus the NEWNE grid to which the project is physically connected.

The project uses the approach (a) of the baseline methodology and the combined margin emission factor for the Southern grid, as used for the project, has been estimated using the following seven steps of "Tool to calculate the emission factor for an electricity system" (Version 02.2.0, EB 61) and using publicly available data of "Central Electrical Authority" (the most recent version "CO_2 Baseline Database Version 6.0" available at the time of submission of the CDM PDD to the DOE for Global Stakeholders Consultation).

The following information has been used for the calculation of baseline emissions:

Operating margin CO_2 emission factor ($EF_{grid,OM,y}$)				
Parameter	Year	Unit	Value	Source / Reference
Simple Operating Margin (NEWNE Grid)	2007 - 2008	tCO_2/ MWh	1.00	"CO_2 Baseline Database for Indian Power Sector" version 06.0 published by the Central Electricity Authority, Ministry of Power, Government of India available at www.cea.nic.in
Simple Operating Margin (NEWNE Grid)	2008 - 2009	tCO_2/ MWh	1.01	
Simple Operating Margin (NEWNE Grid)	2009 - 2010	tCO_2/ MWh	0.98	
3 year generation weighted average of Operating		tCO_2/ MWh	0.994	Calculated based on the

margin CO_2 emission factor		9	most recent data available at the time of submission of the CDM-PDD to the DOE for validation
Note: 3 year generation weighted average of Operating margin CO_2 emission factor has been calculated following the guidelines provided in "Tool to Calculate the emission Factor for an Electricity System" (Version 02.2.0)			

Build margin CO_2 emission factor ($EF_{grid,BM,y}$)				
Parameter	Year	Unit	Value	Source / Reference
Build Margin (NEWNE Grid)	2009 - 2010	tCO_2/ MWh	0.8123	"CO_2 Baseline Database for Indian Power Sector" version 06.0 published by the Central Electricity Authority, Ministry of Power, Government of India available at www.cea.nic.in

Combined margin CO_2 emission factor ($EF_{grid,CM,y}$ or EF_y)				
Parameter	Notations	Unit	Value	Source / Reference
Operating margin CO_2 emission factor	$EF_{grid,OM,y}$	tCO_2/ MWh	0.99	Please refer to the above
Build margin CO_2 emission factor	$EF_{grid,BM,y}$	tCO_2/ MWh	0.81	Please refer to the above
Combined margin CO_2 emission factor	$EF_{grid,CM,y}$ or EF_Y	tCO_2/ MWh	0.9036	Calculated
Note: Combined margin CO_2 emission factor has been calculated following the guidelines provided in "Tool to Calculate the emission Factor for an Electricity System" (Version 02.2.0)				

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:

UNFCCC simplified modalities seek to establish additionality of the project activity as per Attachment A to Appendix B[6], which listed various barriers, out of which, at least one barrier shall be identified due to which the project would not have occurred any way. The methodology lists out four 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.
The following barriers have been identified for the project activity at the time of the investment decision to establish the additionality of the project.

The proposed project activity is additional (using Attachment A to Appendix B of the simplified M&P for small-scale CDM project activities) because the project activity would not have occurred anyway due to the following barrier:

Investment barrier:

The implementation of the project activity faced a stiff barrier to investment due to the expected low return from it in absence of CDM revenue. The project participant has chosen to demonstrate this barrier

to investment as per the guidance provided in 'Guidelines on the assessment of investment analysis/ Version 05' in the following manner:

Selection of financial indicator:

The project activity shall be funded from both internal accruals as well as loan from banks. Therefore, Project IRR has been chosen as the financial indicator for the project activity.

Based on the guidelines, the PP has considered Prime Lending Rate (PLR) prevailing at the time of investment decision as benchmark. During the time of investment decision the PLR of State Bank of India was 11.75%[7].

Selection of benchmark analysis:

For the project activity under consideration the baseline alternative is supply of electricity from a grid. Therefore, there is no investment associated in the baseline scenario identified for the project activity under consideration. Hence as per the 'Guidelines on the assessment of investment analysis/ Version 05' a benchmark analysis is deemed to be appropriate for demonstrating additionality for the small scale project activity.

Selection of Appropriate Benchmark:

The financial viability of the project activity has been assessed by the project participant on the basis of Internal Rate of Return (IRR) for the project as the financial indicator. As per the 'Guidelines on the Assessment of Investment Analysis/Version 05', Local commercial lending rates or weighted average cost of capital (WACC) are appropriate benchmarks for a project IRR. The project participant has chosen the Prime Lending rate of a nationalized bankmark as the benchmark for the project activity.

Parameters	Unit	Value	Source
Capacity of Captive Power Plant(MW)	MW	15.00	Detailed Project Report

[6] http://unfccc.int/resource/docs/2005/cmp1/eng/08a01.pdf#page=43

[7] http://in.reuters.com/article/2011/07/07/india-plr-idINL3E7I71K520110707

Total Capital Cost	Rs. Million	728.30	Detailed Project Report
Equity Percentage	%	38.21	Detailed Project Report
Equity Amount	Rs. Million	278.30	Detailed Project Report
Equity Percentage	%	61.79	Detailed Project Report
Debt Amount	Rs. Million	450.00	Detailed Project Report
Interest Rate on Bank Loan	%	11.00%	Detailed Project Report
Operating Period	days	340	Detailed Project Report
Plant Load Factor		0.80	Detailed Project Report
Gross Annual Generation	MWh	97,920	Calculated
Annual Power Plant Auxiliary Consumption	MWh	9792	Calculated
Annual Export to the Grid	MWh/annum	88128	Calculated
Power Sell Rate	INR/kWh	4.4	Power Purchase Agreement
Escalation in power sell rate	%	3%	
Emission Factor of the NEWNE Grid	tCO_2/MWh	0.90	CEA Database Version 6.0

Parameters	Unit	Value	Source
SLM Depreciation rate for Buildings as per companies act,Schedule XIV	**%**	3.34	Companies Act, Schedule XIV
SLM Depreciation rate for Plant & Machineries as per companies act,Schedule XIV	%	5.28	Companies Act, Schedule XIV
Capital cost - Civil Works (in Rs. Million)	Rs. Million	120.00	Project Feasibility Report
Capital Cost - Plant and	Rs. Million	447.90	Project Feasibility Report

Machinaries			
I. Tax Rate %	%	33.99	Existing Tax Rate in 2010
WDV Depreciation Rate for Building	%	10	Companies Act, Schedule XIV www.fastfacts.co.in/resources/DepIncomeTax.rtf
WDV Depreciation Rate for Machineries	%	80	Companies Act, Schedule XIV www.fastfacts.co.in/resources/DepIncomeTax.rtf

Parameters	Unit	Value	Source
Cost of coal	Rs/ ton	2350	Invoices and quotations (Value is taken conservatively)
Annual coal requirement	ton/ annum	14688	Detailed Project Report
Annual coal cost	Rs. Million	34.52	calculated
Cost of biomass	Rs. Million	2250	Invoices and quotations (Value is taken conservatively)
Annual biomass requirement	ton/ annum	83232	Detailed Project Report
Annual biomass cost	Rs. Million	187.27	calculated
Annual fuel cost	Rs. Million	221.79	calculated
Fuel escalation	%	5	
Annual Repair & Maintenance cost	Rs. Million	3	Detailed Project Report
R & M cost escalation	%	5	
Annual salaries & wages	Rs. Million	21.5	Detailed Project Report
Salaries & wages	%	10	
Annual administration & expenses	Rs. Million	5.8	Detailed Project Report
Administration escalation	%	15	
Annual water cost	Rs. Million	5.4	Detailed Project Report
Water cost escalation	%	3	

Based on the above inputs, the project IRR works out to be 7.12%, which is less than the benchmark rate of 11.75%. A comparison of the project IRR with the benchmark rate would reveal that the project is not financially attractive.

Sensitivity analysis: A sensitivity analysis has been performed for all alternatives, to confirm that the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. Here, such an analysis has been performed by applying a sensitivity of ±10% to the following parameters:

1. Project cost

2. PLF

Parameter description	Sensitivity	IRR
		Without CDM
Without sensitivity	0%	7.12%
Project cost	10%	1.74%
	-10%	11.20%
PLF	10%	10.32%
	-10%	1.91%

The above analysis shows that when the parameters are varied to the tune of +10%/-10%, the Internal rate of return for the project activity changes. However, the IRR still remains below the benchmark for the project activity.

Prior consideration - CDM

In accordance with the "Guidelines on the demonstration and assessment of prior consideration of the CDM')

"*For project activities with a starting date on or after 02 August 2008, the project participant must inform a Hst Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date and shall contain the precise geographical location and a brief description of the proposed project activity, using the standardized form F-CDM- Prior Consideration*"

The start date for the project activity under consideration is 15th March 2011 (Date of placing the Purchase order for Turbine). The project participant had already informed both the Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status using the standardized form F-CDM-Prior Consideration. The above mentioned notification was made by the project participant dated 28 April 2011, which is within six months from the Project activity start date i.e. the date on which the purchase order for the WTG was placed. Evidences substantiating the above have been submitted to the DOE. The same may be verified against the following Link to the UNFCCC website:

http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions:

Baseline methodology for project category *I.D* has been detailed in methodology AMS- I.D. (Version-17, EB- 61). As per paragraph 10,

The baseline scenario is that the electricity delivered to the grid by the project activity that otherwise would have been otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

Since the project activity is a new power plant, the above stated baseline is applicable for the project.

Further, as per paragraph 10 of the methodology AMS-I.D./version 17.

'*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.*'

$BEy = EG_{BL,y} \times EF_{CO2,grid,y}$

Where,

BEy = Baseline emissions in year y; (t CO_2)

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

$EF_{CO2,grid,y}$ = CO_2 Emission Factor of the grid in year y; (t CO2 / MWh)

As per paragraph 12 of AMS - I.D. (Version- 17, EB- 61), '*the emission factor can be calculated in a transparent and conservative manner as follows:*

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

.

OR

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

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

Baseline emission reductions have been estimated using 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" (Version- 02.2.0, EB- 61) by using the six steps as described in the tool:

Please refer to Annex-III for the detailed computation of the baseline emission factor.

Further as per paragraph 11 of AMS- I.D. (Version- 17, EB- 61), the product of Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y in MWh with CO_2 Emission Factor of the grid in year y in tCO_2/MWh will give the estimated value of Baseline Emissions tCO_2 (BEy).

Thus,

$$\mathbf{BE_y = EG_{BL,y} \times EF_{CO2,grid,y}}$$

As per paragraph 19 of the methodology AMS -1D, version 17, "The quantities and types of biomass and the biomass to fossil fuel ratio (in case of co-fired system) to be used during the crediting period should be explained and documented transparently in the CDM-PDD. For the selection of the baseline scenario, an ex ante estimation of these quantities should be provided."

The project participant would use rice husk and coal in the ratio of 85:15 for the project activity. The quantity of rice husk used will be 83232 tonnes and coal used will be 14688 tonnes.

Project Emissions:

As per paragraph 19 of approved methodology AMS- I.D. (Version- 17, EB- 61)

For most renewable energy project activities, PEy = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the latest version of ACM0002.

• Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption)

• Emissions from water reservoirs of hydro power plants

According to the guidance of the methodology AMS 1D, version 17 "CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the .Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion."

The project activity involves co-firing of fossil fuel coal) with the main fuel rice husk. The project emissions shall be calculated using the latest tool of "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion.*"

In times of emergency, there could be firing of Diesel oil for the project activity. However, the project activity is not considered as an ex-ante computation and shall be calculated in the computation of project emissions as and when it is used.

Leakage Emissions (LE_y):

As per paragraph 20 of the approved methodology AMS-I.D. (Version- 17, EB- 61), *If the energy generating equipment is transferred from another activity, leakage is to be considered*. The leakage emissions may be considered as zero tCO_2 as no such equipment shall be transferred from another project activity.

As there is no transfer of the energy generating equipment, hence there is no Leakage emission associated to this project.

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

Data / Parameter:	**$EF_{CO2,y}$**
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for the NEWNE grid system
Source of data used:	CEA published grid emission factors -Version 06.0
Value applied:	0.9036
Justification of the choice of data or description of measurement methods and procedures actually applied :	The central Electricity Authority (CEA) of the Government of India publishes annually "CO_2 baseline database" and maintains the same on a regular basis. The database is available on a regular basis. The database is available in the public domain and is an authentic and accurate source of data.
Any comment:	

Data / Parameter:	**EF_{fuel}**
Data unit:	Kg/TJ
Description:	Emission factor of the Diesel
Source of data used:	2006 IPCC Guidelines for National Green House 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 :	The source of data is as per guidelines. IPCC default values are conservative.
Any comment:	The value chosen is as per the upper 95% confidence level as specified in the 2006 IPCC Guidelines. Hence, this is deemed conservative.

Data / Parameter:	ρ_i
Data unit:	Kg/lt
Description:	Density of Fossil fuel used for project site (Diesel)
Source of data used:	Society of Indian automobile manufacturers (SIAM) www.siamindia.com/scripts/Diesel.aspx
Value applied:	0.82
Justification of the choice of data or description of measurement methods and procedures actually applied :	The SIAM value is considered as it is publicly available and can be referred as authentic source.
Any comment:	---

Data / Parameter:	Calorific value Diesel
Data unit:	Kcal/kg

Description:	Calorific value of Diesel used in project plant for transportation of biomass and DG Set.
Source of data used:	2006 IPCC Guidelines for National Green House gas Inventories, Volume2, Chapter 1, Table 1.3
Value applied:	43.3 TJ/Gg
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC Default value is being used.
Any comment:	Project emissions due to burning of diesel has been kept as zero. However, the same shall be monitored and the project emissions will be deducted in accordance with the latest tool , *"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"*

Data / Parameter:	$BF_{surplus,y}$
Data unit:	% (Percentage)
Description:	Surplus quantity of available biomass used in the plant, upon the total quantity of consumption of respective biomass in the project region including the project activity, during the year y
Source of data used:	Project participant has voluntarily appointed a third party to conduct the assessment study as the same is not publicly available.
Value applied:	The percentage of surplus availability of biomass utilized in the project activity has been demonstrated in section B.6.3. Surplus availability of biomass used in the project activity is larger than 25% of the total consumption of the region. Surplus availability of the project specific biomass fuel type i.e. paddy husk is around 32% which is more than 25% of the total consumption in the region (certified by 'Chhattisgarh Renewable Energy Development Agency (CREDA)').

Justification of the choice of data or description of measurement methods and procedures actually applied :	The parameter is a calculated value derived from the biomass assessment study carried out. The Survey has been carried out in July 2011. The assessment survey has been carried out taking a 0-75 K.M. radius around the site of the proposed biomass based power plant. As per the Report surplus quantity of biomass is available in the Project region.
Any comment:	The study would remain fixed for the entire crediting period for the project activity as per "General guidance on leakage in biomass project activities" Version 03, EB 47 - Annex 28.

B.6.3 Ex-ante calculation of emission reductions:

Emission Reduction Calculations:

Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.

Baseline emission factor (Combined Margin) ($\mathbf{EF_{grid, CM, y}}$ / $\mathbf{EF_{grid,CO2,y}}$) = 0.9035 tCO_2e/MWh

Annual gross electricity generation = 15 MW (project capacity) × 80% (PLF) × 8160 (operating hours)

= 97920 MWh

Auxiliary consumption by the project activity = 10%× 97920 MWh

= 9792 MWh

Net electricity generated from the project activity = (97920 MWh (Gross) – 9792 MWh (auxiliary))

= 88128 MWh

Quantity of Biomass consumed annually=83232 tonnes

Quantity of coal consumed annually=14688 tonnes

GCV of biomass fuels = 3000 Kcal/Kg

GCV of coal = 3000 Kcal/Kg

Combined CO_2 emission factor of the NEWNE Grid = 0.9036 t CO_2/MWh

Baseline emissions from the project activity = (net electricity from the project activity* emission factor of the NEWNE grid)

= (88128.51* 0.9036)

= 79632.51 t CO_2

Net calorific value of coal used = 3000 Kcal/Kg

Carbon (%) in coal = 30%

Project emissions based on option (A) of the methodology = (30%* 14688*44/12)

= 16156.80

Emission Reductions from the project activity = Baseline emissions- Project emissions

= 79632.51 - 16156.80

= 63475.61 t CO_2

Hence, the total emission reductions after rounding off the above result, is 63475 tonnes of CO_2 annually and 634750 tonnes of CO_2 for the entire duration of the crediting period.

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

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
01/09/2012-31/08/2013	16157	79632	0	63475
01/09/2013-31/08/2014	16157	79632	0	63475
01/09/2014-31/08/2015	16157	79632	0	63475
01/09/2015-31/08/2016	16157	79632	0	63475
01/09/2016-31/08/2017	16157	79632	0	63475
01/09/2017-31/08/2018	16157	79632	0	63475
01/09/2018-31/08/2019	16157	79632	0	63475
01/09/2019-31/08/2020	16157	79632	0	63475
01/09/2020-31/08/2021	16157	79632	0	63475
01/09/2021-31/08/2022	16157	79632	0	63475
Total (tonnes of CO_2 e)	**161570**	**796325**	**0**	**634750**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**Gross electricity generated by the project activity**
Data unit:	kWh
Description:	Total quantity of Electricity generated from the project activity per year
Source of data to be used:	From the readings of the Energy Meters located at the plant site
Value of data	97920000 (ex-ante computed figure)
Description of measurement methods and procedures to be applied:	The value is noted down from calibrated energy meters
QA/QC procedures to be applied:	The data will be directly measured and monitored continuously at the project site. All relevant records will be checked to ensure consistency. The meter will be calibrated annually.
Any comment:	--

Data / Parameter:	**Quantity of auxiliary which is consumed by the project**
Data unit:	KWh
Description:	Auxiliary electricity consumed by the project activity
Source of data to be used:	Energy meters located at the plant site
Value of data	9792000 (ex-ante computed figure)
Description of measurement methods and procedures to be applied:	The value is noted down from calibrated energy meters

QA/QC procedures to be applied:	The data will be directly measured and monitored continuously at the project site. All relevant records will be checked to ensure consistency. The meter will be calibrated annually.
Any comment:	--

Data / Parameter:	**Quantity of net electricity supplied to grid in year y**
Data unit:	KWh
Description:	Net electricity which is supplied to CSEB Grid
Source of data to be used:	Readings of the main meter and check meter (if any) installed at the CSEB sub-station
Value of data	88128 (ex-ante computed figure)
Description of measurement methods and procedures to be applied:	Measured monthly using calibrated meters.
QA/QC procedures to be applied:	The meter located at the sub-station is under the discretion of the CSEB grid. CSEB is responsible for the regular calibration of its meters and the same is beyond the control of the project participant.
Any comment:	The electricity exported to grid every month will be cross-checked against the monthly electricity invoice raised by the project participant to CSEB.

Data / Parameter:	**Quantity of biomass consumed in year y**
Data unit:	Tonnes per year
Description:	Biomass consumed per year for the project activity
Source of data to be used:	Plant Records
Value of data	83232 (ex-ante computation)
Description of measurement methods and procedures to be applied:	The quantity of biomass will be measured using weigh bridge installed at the plant site.

QA/QC procedures to be applied:	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The weigh bridge will be calibrated annually.
Any comment:	--

Data / Parameter:	**Quantity of fossil fuel consumed in year y**
Data unit:	Tonnes
Description:	Coal consumed per year for the project activity
Source of data to be used:	Plant Records
Value of data	14688 (ex-ante computation)
Description of measurement methods and procedures to be applied:	The quantity of coal will be measured using weigh bridge installed at the plant site.
QA/QC procedures to be applied:	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The weigh bridge will be calibrated annually.
Any comment:	--

Data / Parameter:	$NCV_{biomass}$
Data unit:	Kcal/Kg
Description:	Net Calorific value of biomass used in project activity
Source of data to be used:	Third party reports
Value of data	30%
Description of measurement methods and procedures to be applied:	The project participant shall undertake periodic NCV of biomass by external third party analysis
QA/QC procedures to	--

be applied:	
Any comment:	--

Data / Parameter:	***NCV*** $_{Coal}$
Data unit:	Kcal/Kg
Description:	Net Calorific value of coal used in project activity
Source of data to be used:	Third Party Reports
Value of data	3000
Description of measurement methods and procedures to be applied:	The project participant shall undertake periodic NCV of coal by external third party analysis.
QA/QC procedures to be applied:	--
Any comment:	--

Data / Parameter:	**Diesel Quantity**
Data unit:	Litre
Description:	Quantity of Diesel consumed in DG Set
Source of data to be used:	Plant Records
Value of data	
Description of measurement methods and procedures to be applied:	The quantity will be measured and monitored through dedicated log book for diesel consumption in DG set. The log book will have details of total quantity of diesel used in DG set. A level gauge is used for the same purpose.
QA/QC procedures to be applied:	The DG shall be calibrated annually by a third party.
Any comment:	--

B.7.2 Description of the monitoring plan:

Data Monitoring:

In order to ensure delivery of CERs, the following relevant data needs to be monitored

- Electricity exported to the grid
- Electricity imported from the grid
- Diesel consumption in DG set, if any
- Surplus biomass available in the region on an annual basis; surplus availability greater than 25% of the biomass consumption in the region including project activity will be evaluated *ex-ante* at the start of each crediting period

Frequency of Monitoring and Recording:

1. *Electricity Supplied to grid*: Daily meter readings will be recorded by plant personnel in the log books. The daily report will be aggregated to arrive at monthly generation. Data will be entered into computer on a monthly basis for electronic archiving.

2. *Diesel Oil Consumption:* The fuel consumption will be recorded using a level gauge indicator and readings will be recorded on a continuous basis, as and when the DG set is in use. Log books will be maintained to record quantity consumed and monthly reports would be generated from the logged data. Fuel receipt voucher/ purchase record will be maintained to monitor the actual fuel procured. Data will be entered into computer on a monthly basis and archived electronically.

3. *Fossil fuel consumption:* Fossil fuel, whenever used, would be monitored using a weigh bridge and log books will be maintained to record the quantity consumed. Fuel receipt voucher/ purchase record will be maintained to monitor the actual fuel procured. Data will be entered into computer every month and archived electronically.

Data Archiving:

Log sheets and the other records would be archived and kept electronically for at least 2 years after the end of crediting period.

Calibration Frequency:

Periodic calibration schedule, which spreads over the year, for all monitoring equipments (energy meters

– export, import and DG set; weigh bridge) would be prepared and maintained. As per the schedule, calibration of instruments and equipments will be carried out annually and recorded in calibration reports.

Responsibilities under CDM:

- Take necessary steps to ensure smooth operation & maintenance of the power plant
- Log the electricity exported / imported on a daily basis
- Compile the daily data of electricity generation and generate monthly reports to be sent to GM (Projects)
- To monitor the fuel purchase and consumption for calculating emission reductions generated by the project activity
- To maintain records of fuel purchase for verification of emission reductions
- Ensure proper functioning of the monitoring equipments and arrange calibration, as per procedures
- Report to the CDM coordinator in case of any major break-down of the power system/instruments.

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 of the baseline scenario: 20/10/2011

Name of the responsible entity:

Responsible person(s) / entity (ies): Experts and consultants of Shanti G.D. Ispat & Power Pvt. Ltd. Shanti G.D. Ispat & Power Pvt. Ltd. is also the project proponent. Please refer Annex 1 for detail information of the contact person.

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:

15 March 2011

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

25 years

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

C.2.1.	Renewable crediting period

Not applicable

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

Not applicable

C.2.1.2.	Length of the first crediting period:

Not applicable

C.2.2.	Fixed crediting period:

C.2.2.1.	Starting date:

01/09/2012 or date of registration of the project with UNFCCC (whichever is later)

C.2.2.2.	Length:

10 Years, 00 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:

As the project activity is not enlisted in the "list of projects or activities requiring prior environmental clearance"[8], published by Ministry of Environment and Forest in their "Environmental Impact Assessment Notification-2006", so it does not fall under the purview of the Environmental Impact Assessment (EIA).

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:

There is no significant negative impact of the project activity on the environment. Therefore environmental impact assessment undertaken in accordance with the procedures as required by the host Party is not necessary.

SECTION E. Stakeholders' comments

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

No specific public consultation / participation requirements are specified in Indian statutes for setting up of small-scale industries. However, there are certain procedural requirements, which every project investor needs to follow before implementing any project.

Before implementing any project, project investors / developers need to identify the stakeholders, prepare necessary documents, approach the identified stakeholders directly and obtain required clearances / approvals. The stakeholders after review of documents and investment profile, will accord approvals / licences or send comments in writing to project investors for further clarifications / corrections. In case

[8] provided in page no. 10-18 "list of projects or activities requiring prior environmental clearance"(http://envfor.nic.in/legis/eia/so1533.pdf)

they are not satisfied with the project design or they feel that the project impacts any of the local environment / social / economical environments, they will not issue clearances / approvals and stop the implementation of the project. All the stakeholders have been identified and requested to provide their feedbacks/ suggestions on the project activity. The issues identified by the stakeholders have been discussed by the Management of SGDIPL and necessary actions have been undertaken. The stakeholder consultation is generally carried out in a phased manner at SGDIPL. The same is explained below:

Table E.1: Stake Holder Consultation Protocol	
Phase	Activity
Identification of Stakeholders	All the parties involved with the project activity at any stage of its implementation (i.e. from conceptualisation to actual implementation) are considered to be a potential stakeholder for the project activity. For the project activity under consideration, the following government and non-government parties and organizations are identified as the stakeholders: • Local Population • Employees of Shanti G.D. Ispat & Power Limited • Major Equipment Supplier
Phase-II: Information Sharing	The representatives from SGDIPL have explained to the identified stakeholders and shared with them the salient features of the project activity and its probable socio-economic and environmental impacts on the locality (Information have been shared with the stakeholders by writing to them). They are encouraged to give their feedbacks either verbally or through written communications on all the aspects of the project activity implementation and its operation.
Phase-III: Compilation of the comments received and measures undertaken	The comments received from all the stakeholders are compiled and their significance is considered by the project team of SGDIPL. All the identified stakeholders have shared their feedback by writing to the project developer in response to the letters sent to them by SGDIPL asking for the stakeholders' opinion about the project activity undertaken. Appropriate measures are undertaken to address the issues raised by the stakeholders. In case of any significant comment received from the

	stakeholders, the same is escalated to the Management Level and necessary actions are implemented by the Management of SGDIPL.

E.2. Summary of the comments received:

Table-E.2: Summary of Stakeholder Consultation

Sl No	Name of Stakeholders	Mode of Communication	Feedback
1	Village Panchayats	Representatives of SGDIPL spoke to the local people and explained to them the salient features of the project activity. They were requested to provide their feedbacks on the same. Written communication was sent to them.	The local population acknowledged the positive socio-economic and environmental impacts due to the project activity. They appreciated SGDIPL's initiative of implementing the project activity. They assured their support to the Management of SGDIPL via a written communication.
2.	Equipment Suppliers	Brief details on the project activity implementation and its associated impacts were verbally explained to the equipment suppliers of the project activity. Communication was also sent in writing to the equipment suppliers briefing them about the project activity under	The project activity has generated business opportunities for them. They have appreciated the initiative of SGDIPL and provided their support throughout to make it successful.

		consideration.	
3.	Technical Consultant	Brief details on the project activity implementation and its associated impacts were verbally explained to the technical consultants of the project activity. Communication was also sent in writing to the equipment suppliers briefing them about the project activity under consideration.	The project activity has generated business opportunities for them. They have appreciated the initiative of SGDIPL and provided their support throughout to make it successful.

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

SGDIPL has so far received only positive feedbacks on the project activity from all the stakeholders. However stakeholder consultation is an on-going process and the project participant will continue the process. All the comments received, so far, have been considered and given due consideration while preparing the CDM Project Design Document.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Shanti G.D. Ispat & Power Private Limited.
Street/P.O.Box:	504, Rajeev Gandhi Complex, Bal Asheam Compound, Kutchery Chowk
Building:	
City:	Raipur
State/Region:	Chhattisgarh
Postfix/ZIP:	--
Country:	India
Telephone:	07714243000
FAX:	07714243031
E-Mail:	sgdipl@yahoo.co.in
URL:	--
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Agrawal
Middle Name:	
First Name:	Anup
Department:	
Mobile:	+91 94252 02681
Direct FAX:	+91 77142 43031
Direct tel:	
Personal E-Mail:	anupgd@gmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

THERE IS NO PUBLIC FUNDING FOR THE PROJECT ACTIVITY.

Annex 3

BASELINE INFORMATION

Baseline emission reductions have been estimated using 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" (Version- 02.2.0, EB- 61) by using the following six steps:

Step 1: Identify the relevant electric power systems

The Indian electricity system is divided into two regional grids, viz. (1) Northern, Eastern, Western, North-Eastern (NEWNE) and (2) Southern grid. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighboring countries like Bhutan and Nepal.

Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the project activity. The NEWNE Grid has been chosen for the project in question.

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

PP has to choose between the following two options to calculate the operating margin and build margin emission factor:

• Option I: Only grid power plants are included in the calculation.

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

The PP has chosen "*Option I: Only grid power plants are included in the calculation"* as the grid system in India is very enough stable and off grid generation is not significant.

Step 3: Select a method to determine the operating margin (OM):

According to the tool, the calculation of the operating margin emission factor 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.

Any of the four methods can be used for calculating OM, The simple adjusted OM and dispatch data analysis OM cannot be currently applied in India due to lack of necessary data however, 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.

The Share of Low Cost / Must-Run (% of Net Generation) in the generation profile of the South grid in India in the last five years is as follows:

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)						
Grid	2005-06	2006-07	2007-08	2008-09	2009-10	Average
South	18.0%	18.5%	19.0%	17.4%	15.9%	17.8%

Source: CEA Database Version 06.0

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the NEWNE grid is less than 50 % of the total generation. Hence the Simple OM method can be used to calculate the Operating Margin Emission

factor. The average operating margin method cannot be applied, as low cost/ must run resources in NEWNE grid constitute less than 50% of total grid generation.

The project participants choose an ex-ante option for calculation of the OM with 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, without requirement to monitor and recalculate the emissions factor during the crediting period.

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

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. It may be calculated:

- Based on the net electricity generation, and a CO_2 emission factor of each power unit. (Option A),

Or

- Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option B)

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO_2 Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex-ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system". The project participant, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

The simple OM is calculated as per Option B below.

Option B: Calculation based on total fuel consumption and electricity generation of the system

Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{EL,m,y} = (\sum FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,I,y}) / EG_{m,y}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m = All power units serving the grid in year y except low-cost / must-run power units
i = All fossil fuel types combusted in power unit m in year y
y = The relevant year as per the data vintage chosen in step 3

For this approach (simple OM) to calculate the operating margin, the subscript *m* refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant *m*.
The OM values have been referred from CEA Database which has used above approach. The value of operating margin emission factor is 0.9949 tCO_2 /MWh.

NEWNE Grid: Simple Operating Margin (tCO_2/MWh) (incl. Imports)				
Year	**2007-2008**	**2008-2009**	**2009-2010**	**Generation weighted Average**
Simple Operating Margin (tCO_2/MWh) (incl. Imports)	1.00	1.01	0.98	0.9949
Table reference- CEA Baseline Database, Version 6.0				

Step 5: Calculate the build margin (BM) emission factor:
The build margin emissions factor is the generation-weighted average emission factor of all power units m during the most recent year y for which power generation data is available, calculated as follows:

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

Where:
$EF_{grid,BM,y}$ = *Build margin CO_2 emission factor in year y (tCO_2/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_2/MWh)*
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) is determined as per the procedures given in step 4 (a) for the simple OM, using option A1 for *y* most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

The BM values have been referred from CO_2 Baseline Database which has used above approach. The value of build margin emission factor is 0.8123 tCO_2/MWh.

Step 6: Calculate the combined margin emissions factor

The combined margin is a weighted average of the simple operating margin and the build margin. By default, both margins have equal weights (50%). In particular, for intermittent and non-dispatchable generation types such as wind and solar photovoltaic, the "Tool to calculate the emission factor for an electricity system" (Version 02.2.0, EB 61) allows to weigh the operating margin and build margin at 50% each respectively.

The emission factor $EF_{grid, CM, y}$ of the grid is represented as a combination of the Operating Margin (OM) and the Build Margin (BM). Considering the emission factors for these two margins as $EF_{grid, OM,, y}$ and $EF_{grid, BM, ,y,}$ then the $EF_{grid, CM, y}$ is given by:

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

Where:

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

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

W_{OM} = Weighting of operating margin emissions factor (%)

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

(Where $w_{OM} + w_{BM} = 1$).

Thus the grid emission factor for NEWNE Grid is calculated as below:

$EF_{grid,CM,y}$

= ($EF_{grid,OM,y}$ + $EF_{grid, BM,y}$)/2

= (0.9949 + 0.8123)/2

= 0.9036 t CO_2/MWh.

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Annex 4

MONITORING INFORMATION

There is a well defined project management structure for monitoring the project activity. The CDM project of SGDIPL will have a team that will be supervised by the Director of SGDIPL. The General Manager – Projects would co-ordinate the project activity at the site and will report to the Director through an organisation structure as illustrated in this section and establish a monitoring procedure to ensure completeness and accuracy.

Objective of Monitoring Procedure:

This procedure will set guidelines that SGDIPL would follow to monitor the parameters regularly and ensure quality and accuracy in monitoring. It elaborates the functions of the monitoring team and procedures to be followed to monitor CDM parameters.

CDM Team:

The CDM team comprises of personnel from the various departments at the plant. Project engineers/executives from the fuel and electrical division would conduct their activities in their respective divisions and the assistant general manager (plant manager) would oversee their operations.

Functions of CDM Team:

- Ensure operation of the project activity to comply with the monitoring procedures
- Log relevant project activity data periodically
- Ensure accuracy of data by proper maintenance and calibration of monitoring equipment
- Take necessary permission from GM (Projects) before changing any monitoring equipment related to project activity
- Monitor emissions reduction generated by the project activity and maintain records of relevant data for verification of CERs

Data Monitoring:

In order to ensure delivery of CERs, the following relevant data needs to be monitored

- Electricity exported to the grid

- Electricity imported from the grid
- Diesel consumption in DG set, if any
- Surplus biomass available in the region on an annual basis; surplus availability greater than 25% of the biomass consumption in the region including project activity will be evaluated *ex-ante* at the start of each crediting period

Frequency of Monitoring and Recording:

1. *Electricity Supplied to grid*: Daily meter readings will be recorded by plant personnel in the log books and energy generation will be calculated. The daily report will be aggregated to arrive at monthly generation and generate a monthly report. Data will be entered into computer on a monthly basis for electronic archiving.

2. *Diesel Oil Consumption:* The fuel consumption will be recorded using a level gauge indicator and readings will be recorded on a continuous basis, as and when the DG set is in use. Log books will be maintained to record quantity consumed and monthly reports would be generated from the logged data. Fuel receipt voucher and purchase record will be maintained to monitor the actual fuel procured. Data will be entered into computer on a monthly basis and archived electronically.

3. *Fossil fuel consumption:* Fossil fuel, whenever used, would be monitored using a weigh bridge and log books will be maintained to record the quantity consumed. Fuel receipt voucher and purchase record will be maintained to monitor the actual fuel procured. Data will be entered into computer every three months and archived electronically.

Data Archiving:

Log sheets and the other records would be archived and kept electronically for at least 2 years after the end of crediting period.

Calibration Frequency:

Periodic calibration schedule, which spreads over the year, for all monitoring equipments (energy meters – export, import and DG set; weigh bridge) would be prepared and maintained. As per the schedule, calibration of instruments and equipments will be carried out annually and recorded in calibration reports.

CDM – Executive Board

Responsibilities under CDM:

- Take necessary steps to ensure smooth operation & maintenance of the power plant
- Log the electricity exported / imported on a daily basis
- Compile the daily data of electricity generation and generate monthly reports to be sent to GM (Projects)
- To monitor the fuel purchase and consumption for calculating emission reductions generated by the project activity
- To maintain records of fuel purchase for verification of emission reductions
- Ensure proper functioning of the monitoring equipments and arrange calibration, as per procedures
- Report to the CDM coordinator in case of any major break-down of the power system/instruments.

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