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

CONTENTS

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 plant in Mahendargarh, Haryana
Version: 01
Date: 12/01/2011

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

Salient features of the Project Activity

The project activity is the installation of a greenfield 10 MW biomass based power plant in village Khurawata of Mahendargarh District in Haryana, India by Star Wire (India) Vidyut Pvt. Ltd. (SWIVPL). The project activity would generate clean power for export to the grid. The generated electricity would displace fossil fuel dominated grid based electricity with a renewable source of electricity thereby reducing GHG emissions. The project activity would involve generation of steam from the firing of renewable biomass in a 40 TPH capacity boiler, with outlet steam parameters at 67 kg/cm^2 (a) and 465 °C which in turn will drive the turbo-generator set with a capacity of 10 MW to produce electricity.

Purpose of the Project Activity

The purpose of the project activity is to utilize biomass fuel (Mustard crop residue, Julia Flora etc.), which is an agriculture waste, to generate electricity. The electricity thus produced will be exported to the Grid and would contribute towards bridging the gap between demand and supply in the power-deficit electricity system from a renewable source which in turn will reduce the GHG emissions.

Project's contribution to Sustainable Development

The Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF), called the National CDM Authority (NCDMA), has stipulated four indicators[1] for sustainable development in the interim approval guidelines for CDM projects. The contributions of project activity towards sustainable development are explained with indicators like contributions to socio-economic, environmental and technological aspects as follows:

Social well being:

- The project activity would contribute towards the local employment by employing skilled and un-skilled personnel for operation and maintenance of the equipment.
- During civil works, a lot of construction work is to be taken place, which will generate employment for local people around the plant site. This will result in the enhanced employment of the people.
- The project activity shall also generate employment opportunities for transporters who shall be engaged in transportation of biomass from nearby collection centre to the project site.
- Procurement of biomass shall open up an additional stream of revenue for the local farmers.

Economic well being:

- The project will create a business opportunity during construction phase for local stakeholders such as suppliers, contractors, bankers etc. contributing to economic well-being aspects.

[1] http://cdmindia.nic.in/host_approval_criteria.htm

- The project would generate employment in the local area, hence leading to the economic prosperity of the local people.
- Procurement of biomass shall provide an additional revenue stream for the local farmers.

Environmental well being:

- The project activity will displace use of fossil fuel based power by renewable energy (biomass based power) and thereby result in reduction of greenhouse gas (GHG) emissions.
- It will also lead to conservation of coal and other non-renewable natural resources.
- The project would also reduce pollution in general such as NO_X and SO_X emissions that would have taken place in the baseline.

Technological well being:

- The project activity utilizes biomass as fuel to generate steam, which further drives a solidly forged and machined turbine to generate power. The exhaust gas is passed through the electrostatic precipitator (ESP) in order to remove particulate matter before sending out to the atmosphere. The project activity utilizes environmentally safe technology for meeting the power and process steam requirements at the unit.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host party)	Private and/or public entity (ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
Government of India (Host Country)	Star Wire (India) Vidyut Pvt. Ltd. (Private entity)	No

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):

India

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

Haryana

A.4.1.3. City/Town/Community etc:

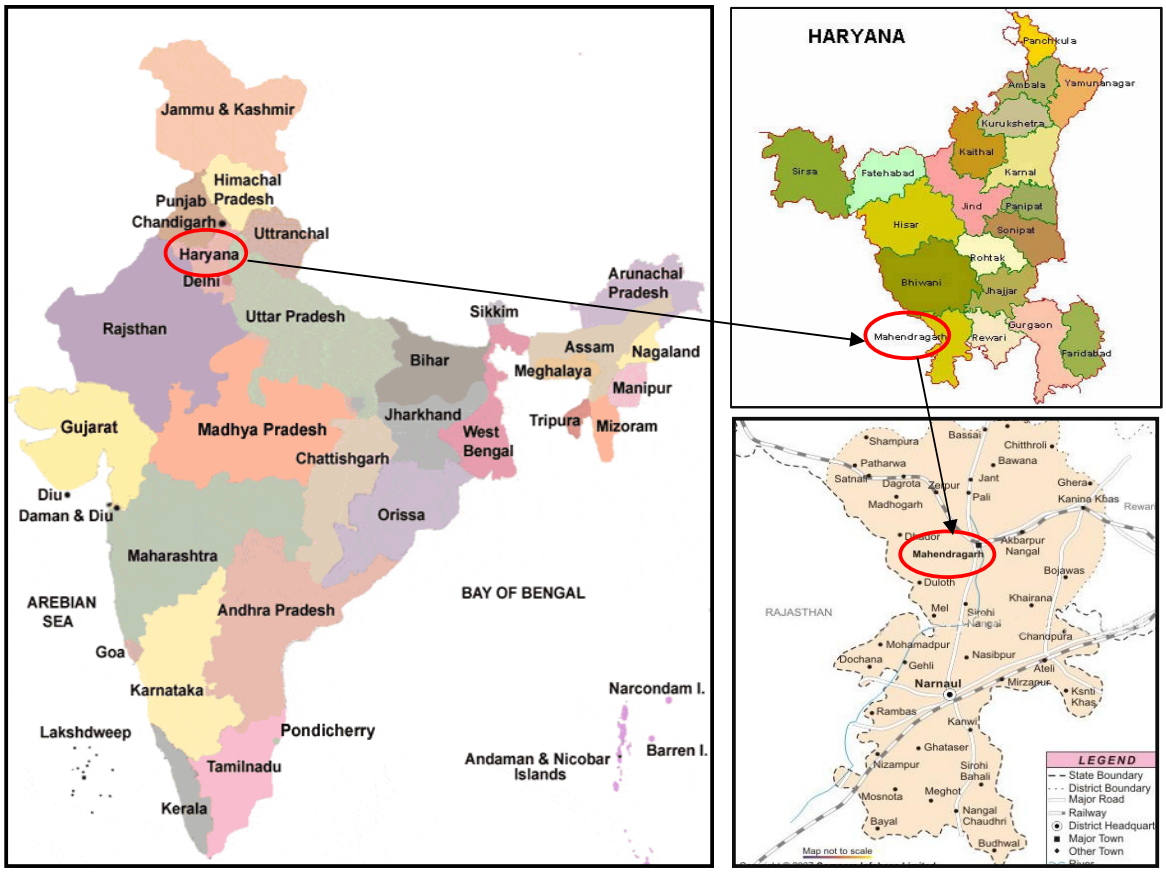
Village: Khurawata
District: Mahendargarh
State: Haryana

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

The project activity is located at village Khurawata in Block-Mahendargarh on Mahendargarh – Zerpur Road in the District of Mahendargarh, Haryana, India. The nearest railway station is Mahendargarh and airport is New Delhi. The exact geographical coordinates of the project site are as follows:

Latitude: 28º 18' 39" N
Longitude: 76º 5' 23" E

The following map shows the exact location of the project activity:



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

As per 'Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories', the project activity falls under:

Type : (I) Renewable energy projects
Category : (D) Electricity generation for a system
Methodology : AMS I.D. Grid connected renewable electricity generation (version 16/ scope 1/EB 54)

The project activity is a Renewable energy project which utilizes biomass for production of electricity. The maximum output capacity of the project is 10 MW (which is ≤ 15 MW, the maximum allowed output

for a small scale renewable energy CDM project) and hence qualifies as a CDM project activity under the above said approved small scale methodology.

Technology of project activity

The power plant envisages the installation of one 40 TPH capacity biomass fired travelling grate type boiler with steam outlet parameters of 67 kg/cm^2 (a) and 465 °C to generate steam and one extraction cum condensing turbo generator of 10 MW capacity to generate power. The boiler and the turbo generator would be installed with all the necessary auxiliary plants and systems required for the efficient operation of the plant. The technical description of these systems is discussed below:

Boiler

The steam generating system for the power plant will consist of one multi fuel type biomass fired boiler of capacity 40 TPH with all the auxiliaries. The boiler shall be travelling grate type (Moving grate) semi-outdoor unit and shall be of bi-drum, natural circulation, balanced draft, membrane wall radiant furnace design with two stage super heaters and inter-stage desuperheater.

Steam Turbine

The steam generated in the boiler is fed to the 10 MW, extraction cum condensing, turbo-generator with the following operational parameters:

Type : Extraction cum condensing
Rating of Turbine : 10 MW
Inlet steam pressure : 64 kg/cm^2 (a)
Inlet steam temperature : 460 ºC

The technology employed is environmentally safe and sound. There will be no technology transfer to the host country for application in the project activity as all the equipment will be purchased from reputed Indian manufacturers.

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

Years	Estimation of annual emission reduction in tonnes of CO_2e
Year 1	52986
Year 2	52986
Year 3	52986
Year 4	52986
Year 5	52986
Year 6	52986
Year 7	52986
Year 8	52986
Year 9	52986
Year 10	52986
Total estimated reductions (tonnes of CO_2e)	529860
Total number of crediting years	**10**

Annual average of the estimated reduction over the crediting period (tCO_2e)	52986

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

There is no recourse to any public funding and the project proponent hereby confirms that there is no divergence of Official Development Assistance (ODA) to the project activity.

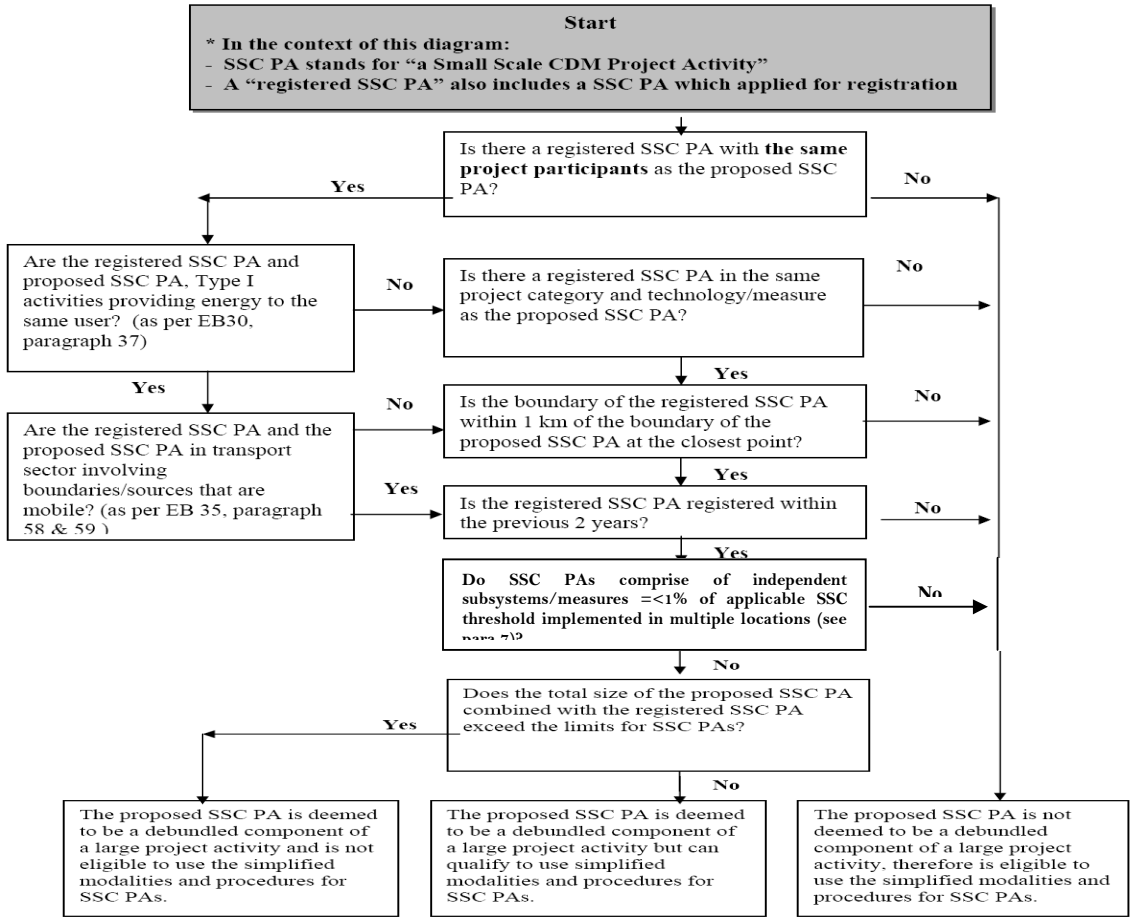
A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

As per the "Guidelines on assessment of debundling for SSC project activities" EB 54, annexure 13 version 3, a proposed small scale project activity shall be deemed to be a de-bundled component of a large activity if there is a registered small scale CDM project activity or an application to register another small scale CDM project activity:

(a) With the same project participant;
(b) In the same project category and technology/measure; and
(c) Registered within the previous 2 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 procedure to determine the same is also provided in the report and is to be followed in the given manner:

I. DETERMINING THE OCCURRENCE OF DEBUNDLING



(a) Is there a registered SSC Project Activity with the same project participants as the proposed SSC PA?
Yes there is an application to register a SSC Project Activity with the same project participants. ("Biomass based power plant in Sirsa, Haryana")

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

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

(d) Is the boundary of the registered SSC Project Activity within 1 km of the boundary of the proposed SSC Project Activity at the closest point?
No (The project "Biomass based power plant in Sirsa, Haryana" is located at Sahuwala-I, Baragudha, Sirsa District, Harayana whereas the proposed project activity is located in Mahendargarh Block of the District of Mahendargarh, Haryana. The distance between the two project sites is much more than 1 km.)

This implies that *"The proposed SSC Project Activity is not deemed to be a debundled component of a large project activity, therefore is eligible to use the simplified modalities and procedures for SSC PAs."*

SECTION B. Application of a baseline and monitoring methodology

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

As per the Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, methodology AMS I.D. (Version 16) has been used.

Type: Renewable energy projects

Category: I.D.

Title: Grid connected renewable electricity generation

Reference:

The approved methodology uses the "Tool to calculate the emission factor for an electricity system" Version 02 for determination of the baseline scenario and also draws upon Appendix B of the simplified modalities and procedures for small-scale CDM project activities "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories".

It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC/CDM (http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html) website.

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

Justification of the choice of methodology

The project activity is Grid connected renewable power cogeneration and meets the applicability conditions of the chosen methodology as follows:

Conditions in the methodology	Applicability
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 that is or would have been supplied by at least one fossil fuel fired generating unit shall apply AMS-I.F	The project activity is the installation of a green-field grid connected power plant for power generation from renewable biomass in Haryana. It would supply electricity to the grid that is primarily dominated with fossil fuel fired generating units hence it satisfies this applicability criteria.
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); or (d) involve a replacement of (an) existing plant(s).	The project activity is a green-field project and involves installation of a biomass based power plant of capacity 10 MW in Haryana.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to	The project activity is a biomass based power project. Hence, the project proponent is not

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/m2; • 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/m2.	required to justify this applicability condition
In the case of biomass power plants, no other biomass types than renewable biomass are to be used in the project plant.	The project activity utilises only the renewable biomass like mustard crop residue, Julia flora, etc., in accordance with Annex 18, EB 23.
If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel5, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project has a gross generation capacity of 10 MW which is entirely sourced from renewable source. The unit has no non-renewable components or provision for future addition of a co-fired fossil fuel system. Thus, it meets the corresponding applicability condition as well.
Combined heat and power (co-generation) systems are not eligible under this category	The project activity involves only power production through biomass. Hence it is eligible to use this methodology.
In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	This condition is not required to be satisfied by the proposed project activity as it is a green-field project activity proposed with the total installed capacity below 15MW.
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.	This condition is not required to be satisfied by the project activity as it is not a modification/ retrofit measure in an existing power plant.

Thus, the project activity satisfies all the applicability conditions of the applied methodology.

B.3. Description of the project boundary:

As per the guidelines mentioned in paragraph 9 of AMS I.D, "*the physical, geographical site of the renewable generation source delineates the project boundary*". The project boundary covers the biomass based power plant, which starts from the biomass storage to the point of supply of power to the grid where the project proponent has a full control. Thus, project boundary includes biomass storage and biomass based power plant. The project boundary is illustrated in the following diagram:

B.4. Description of baseline and its development:

According to paragraph 11 of the methodology AMS.I.D the baseline emissions is 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:

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

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 AMS.I.D, 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_2 /MWh) of the current generation mix. The data of the year in which project generation occurs must be used."

The approach proposed in the "Option (a)" i.e. "Combined Margin" has been used for ascertaining baseline emissions and corresponding emission reductions. The OM and BM emission factor have been considered from the information (CO_2 Baseline Database for the Indian Power Sector -Version 5.0) published by the Central Electricity Authority (CEA), Ministry of Power, Govt. of India which has been computed according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system", version 02. Considering the individual weightings assigned to the OM and the BM emission factors respectively, as prescribed in the 'Tool to calculate the emission factor for an electricity system (Version 02)', the combined margin emission factor for the NEWNE Grid has been estimated at 0.8401tCO_2/MWh.

Data used to determine Baseline Emissions

Parameter	Data Unit	Data Value	Data Source
Plant Capacity	MW	10	DPR
Plant Load Factor	%	80%	DPR
Number of days of operation in a year	Days	365	DPR
Number of hours of operation in a day	Hours	24	DPR
Auxiliary consumption	%	10	DPR
Baseline emission factor	tCO_2/MWh	0.8401	CEA – CO_2 Baseline Database for the Indian Power Sector, Version

			5.0

In accordance with "Guidelines for the reporting and Validation of Plant Load Factors", Version 01 (EB48, Annex 11), the Plant Load Factor (PLF) has been defined ex-ante in the PDD according to option II (a), stating, 'The plant load factor provided to the government while applying the project activity for implementation approval'. The PLF has thus been sourced from the Detailed Project Report (DPR) prepared by third party.

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:

As per the "*Guidance on the demonstration and assessment of prior consideration of the CDM"* Version 03, for project activities with start date after 02 August 2008, the project participant is required to inform the host party DNA and UNFCCC Secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such a notification is required to be made within six months of the project activity start date. In accordance with this guidance, the project proponent had informed the National CDM Authority (Host party DNA) as well as the UNFCCC Secretariat[2] on 27th October 2010 of its intention to seek CDM status so as to make the project activity financially viable. This notification falls within six months of the project activity start date as provided in section C.1.1 as the decision for project activity was taken in the Board meeting held on 25th June 2010.

The implementation of project activity is a voluntary initiative and it is not mandatory or a legal requirement. For power generation, the Electricity Act 2003 does not restrict or empower any authority to restrict the fuel choice, the applicable environmental regulations do not restrict the use of biomass energy and there is no legal requirement on the choice of a particular technology. Therefore, baseline scenario is in compliance with all applicable legal and regulatory requirements.

Explanation of how and why the project activity is additional in accordance with the baseline methodology

In accordance with paragraph 28 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology listed in appendix B may be used for a small-scale CDM project activity if project participants are able to demonstrate that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in ***attachment A of Appendix B***. Accordingly, the investment and prevailing practice barrier faced by the project proponent in the implementation of this project activity have been discussed below:

Barrier due to Prevailing practice

At the project decision making stage, there was no independent biomass based power project operational in the state of Haryana. The practice of generating power from biomass residues has not penetrated the region due to the prohibitive barriers associated with its collection and use in boilers.

Even till date, there is no independent biomass based power project operational in the state. Being only the second independent biomass based power plant to be even conceptualized in the state of Haryana, the project proponent would face difficulties in procurement of biomass. There is no regulated market for the sale of biomass residues in the region. Therefore, fuel logistics have to be planned in a proper way to

[2] http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

ensure operation of the plant throughout the year. The availability of the fuel is seasonal and for a very short duration in the year. The farmers want their field to be quickly cleaned for sowing of next crop. Thus it becomes essential to plan for the collection and storage of the entire annual requirement during this short period.

SWIVPL has planned to set up 20-25 Fuel Collection Centers in and around the Plant site within a radius of 15-20 km. Such Fuel Collection centers shall have to be equipped with weighing bridge and necessary staff for collecting and storage of fuel at such centers. After receipt of fuel, the same shall have to be stored properly at a height of 15'-20' with the help of tractor and dozers. The fuel would then have to be transported from such Centers to the Plant site through Tractor trolleys hired from local farmers. Necessary fire fighting arrangements would also be required at the plant site as well as Collection centers. These fuel logistic measures would entail additional expenditure for the project proponent just to ensure continuous fuel availability for the plant, thereby affecting the profitability of the project activity.

Further, the project proponent has no prior experience in the implementation of this kind of a project activity which is likely to face numerous technological problems associated with the use of biomass. Skilled labourers shall also have to be acquired and trained in plant operations would require further expenditure. Thus with the project activity not being a prevailing practice in the region, the CDM benefits are the only source of revenue that can help insulate the project proponent from deviations in performance of the plant due to their inexperience with the technology and problems associated with collection and use of biomass.

Investment Barrier

The project proponent has chosen to establish the additionality of the project activity by performing benchmark analysis and has chosen Project Internal Rate of Return[3] as the indicator. In order to utilize a benchmark comparable to the project IRR, Weighted Average Cost of Capital (WACC) has been chosen as the benchmark. This is consistent with the "Guidance on the Assessment of Investment analysis", (EB 51) Paragraph 12 which states "*Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR*".

WACC for the project activity has been calculated as the weighted average of the rate of return on equity and debt. The expected rate of return on equity has been arrived at by using the Capital Asset Pricing Model (CAPM) which is well accepted methodology for estimating the expected rate of return on equity and is widely used for capital budgeting decisions. For a firm considering a new project, the CAPM can provide the required rate of return that the project needs to yield, based on its beta, to be acceptable to investors. The benchmark rate of return following the WACC methodology works out to be 13.71%.

$$WACC = [D/(D+E)] \times [Cost\,of\ Debt] \times [1 - T_c/100] + [E/(D+E)] \times [Cost\,of\ Equity]$$

Where,

D = Debt component of total investment

E = Equity component of total investment

T_c = Corporate tax rate

The IRR analysis has been carried out in accordance with the "Guidance on the Assessment of Investment Analysis" (EB 51) Paragraph 3, which states that for carrying out IRR analysis, *"In general a minimum period of 10 years and a maximum of 20 years will be appropriate"*. The project IRR without CDM revenue has thus been computed for a period of 20 years, which is acceptable as per the guidance, with

[3] The detailed IRR calculation sheets have been attached for reference

inclusion of salvage value of its assets at the end of the assessment period based on the following assumptions.

Assumption sheet			
Description	**Value**	**Unit**	**Source**
Installed Capacity	10	MW	Detailed Project Report
No. of working days	365	days	Detailed Project Report
Energy Generation			
Plant Load Factor	80%	%	Detailed Project Report
Gross electricity Generation	70.08	GWh	Calculated
Auxiliary consumption	10%	%	Detailed Project Report
Auxiliary consumption	7.01	GWh	Calculated
Net Exportable Electricity	63.07	GWh	Calculated
Project Cost			
Equity	30%	%	Detailed Project Report
Debt	70%	%	Detailed Project Report
Total Project Cost	556.10	INR million	Detailed Project Report
Tariff			
Tariff	4.42	INR/kWh	Haryana Electricity Regulatory Commission Order (It states that 4 INR/kWh is the base price in FY 2007-08 and escalation shall take place at 2% per year). Further a notification stated that escalation on the base tariff shall be 3% from 2009-10 onwards. But, the same is considered from 2010-2011 as the order came after the decision of implementing the project activity.
Escalation of Tariff	3%	%	
Raw Material			
Raw material mix :			
Biomass	100	%	Detailed Project Report
Cost of Raw Material			
Biomass	1600	INR/MT	Detailed Project Report
Escalation of Biomass Cost	7%	%	Detailed Project Report
Specific Fuel Consumption of Biomass	1.36	ton/MWh	Detailed Project Report
O&M Expenses			
O&M Expenses (% of Project Cost)	7%	%	Haryana Electricity Regulatory Commission Order dated 06/11/2009
Escalation in O&M Expenses	7%	%	Haryana Electricity Regulatory Commission Order dated 06/11/2009
Taxation Rates			
Income Tax	32.3175%	%	As per Income Tax Act

MAT	16.995%	%	
Interest Rates			
Working Capital Interest	12.50%	%	Detailed Project Report
Term Loan Interest	11.50%	%	
Depreciation Rates			
Depreciation Rate as per Companies Act – SLM			
i) Building	3.34%	%	As per Companies Tax Act
ii) Plant & Machinery	7.84%	%	
Depreciation Rate as per Income Tax Act – WDV			
i) Plant & Machniery	80%	%	As per Income Tax Act
ii) Building	10%	%	

Using the assumptions in the table above, the post-tax project IRR for the project activity works out to be negetive indicating loss from the project activity. This clearly demonstrates that the project activity is not at all attractive as an investment option.

A sensitivity analysis has been carried out, by varying the critical parameters of the project activity. In accordance with the "Guidance on Assessment of Investment Analysis" Version 03, Paragraph 17, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues have been subjected to reasonable variation. In accordance with Paragraph 17 of the same guidance, a range of +10% to -10% has been considered as the range of variation.

Sensitivity - Project IRR			
Parameter	**-10%**	**0%**	**10%**
Electricity Generation	#NUM!	#NUM!	#NUM!
Tariff	#DIV/0!	#NUM!	15.36%
Biomass cost	11.35%	#NUM!	#DIV/0!
Project Cost	#NUM!	#NUM!	#NUM!

As can be seen from the table above, the project IRR exceeds the calculated benchmark in case of 10% variation in Tariff. The same is not envisaged as 3% annual escalation of the tariff is already taken into consideration for the calculation of the IRR, in accordance with the HERC tariff order, and further increase is not expected, especially of the magnitude of 10%.

The IRR after taking into consideration the CDM benefit comes out to be 15.94%. This makes it clear that the CDM benefit, in terms of CERs, contributes to a reasonable return and enables the project activity to surpass the benchmark.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission Reductions

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reduction ER_y by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (LE_y), as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e/y).
BE_y = Baseline Emissions in year y (t CO_2e/y).
PE_y = Project emissions in year y (t CO_2/y).
LE_y = Leakage emissions in year y (t CO_2/y).

Baseline Emissions:

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

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

Determination of $EG_{BL,y}$

According to small scale methodology AMS I.D, if the project activity uses fossil fuel to produce electricity, a specific energy consumption of each type of fuel (biomass or fossil) to be used shall be ex-ante. The amount of electricity generated should be calculated by way of two approaches described below and the lower of the two values should be considered as net electricity generation to calculate emission reductions**:**

Approach 1

If fossil fuel is used, the electricity generation metered should be adjusted to deduct electricity generation from fossil fuels using the specific fuel consumption and the quantity of fossil fuel consumed.

$$\Rightarrow \quad EG_{ay,y} = EG_{net,y} - EG_{coal,y}$$

Where,

$EG_{a,y}$ = Net electricity generated adjusted to deduct generation using fossil fuel (coal) using during year y
$EG_{net,y}$ = Net electricity exported to the grid in year y
$EG_{coal,y}$ = Net electricity generated from the combustion of fossil fuels

Net electricity generated from the combustion of fossil fuels will be calculated as:-

$$EG_{coal,y} = EG_{coal,gross,y} - EG_{FF,aux,y}$$

Where,

$EG_{,coal,gross,y}$ = Gross electricity generated from the combustion of fossil fuel (coal) during the year *y*

$EG_{coal,aux,y}$ = Apportioned auxiliary electricity consumption for the electricity generated from the combustion of fossil fuel (coal)

Gross electricity generation from the combustion of fossil fuels will be calculated as:-

$$EG_{coal,Gross,y} = FC_{coal} / SFC_{coal}$$

Where,

FC_{coal} = Quantity of fossil fuel (coal) consumed in the project activity in year *y*

SFC_{coal} = Quantity of fossil fuel (coal) consumed in the project activity in year *y* (determined ex-ante)

Auxiliary electricity consumption will be apportioned to the electricity generated from the combustion of fossil fuels as:-

$$EG_{coal,aux,y} = EG_{coal,gross,y} \times EG_{aux,y}(\%)$$

Where,

$EG_{,coal\ gross,y}$ = Gross electricity generated from the combustion of fossil fuel (coal) in year *y*

$EG_{aux,y}(\%)$ = Percentage of auxiliary electricity consumed ($\frac{EG_{aux}}{EG_{gross}}$) in year *y*

Approach 2

The amount of electricity generated calculated using specific fuel consumption and amount of each type of biomass fuel used

$$\Rightarrow EG_{biomass,i,y} = EG_{biomass,gross,i,y} - EG_{biomass,aux,i,y}$$

Where,

$EG_{biomass,i,y}$ = Net electricity generated by firing biomass of type i in year y

$EG_{biomass,gross,i,y}$ = Gross electricity generated by firing biomass of type i in year *y*

$EG_{biomass,aux,i,y}$ = Apportioned auxiliary electricity consumption for the electricity generated from the firing of biomass of type i in year y

Gross electricity generated by firing biomass of each type will be calculated as:-

$$EG_{biomass,gross,i,y} = FC_{biomass,i,y} / SFC_{biomass,i}$$

Where,

$FC_{biomass,i,,y}$ = Quantity of biomass fuel of type i consumed in year y

$SFC_{biomass,i}$ = Specific fuel consumption of biomass fuel of type i fired in year y (determined ex-ante)

Auxiliary electricity consumption will be apportioned to the electricity generated from the combustion of biomass of type i as:-

$$EG_{biomass,aux,i,y} = EG_{biomass,gross,i,y} \times EG_{aux,y}(\%)$$

Where,

$EG_{biomass, gross, y}$ = Gross electricity generated by firing biomass of type i in year y

$EG_{aux, y}(\%)$ = Percentage of auxiliary electricity consumed ($\frac{EG_{aux}}{EG_{gross}}$) in year *y*

Net electricity generated by firing biomass fuels of all types in year y will be calculated as the sum of electricity generated by biomass fuel of each type:-

$$EG_{biomass,y} = \sum EG_{biomass,i,y}$$

Determination of $EF_{CO2,grid,y}$

In accordance with the "Tool to calculate the emission factor for an electricity system" Version 02, combined margin CO_2 emission factor for grid connected power generation is calculated stepwise as below:

The data used for the calculation of the baseline emission factor was obtained from the baseline calculations published by the CEA, *CO_2 Baseline Database for the Indian Power Sector – Version 5.0*[4], which uses "Tool to calculate the emission factor for an electricity system" Version 02. The relevant parts of the calculations are referenced in the methodology outline below, with detailed data provided in Annex 3. A complete explanation of the assumptions employed by the CEA can be obtained from the *CO_2 Baseline Database for the Indian Power Sector - Version 5.0.*

Step 1: Identify the relevant electricity systems

For determining electricity emission factors, a **project electricity system** is defined by the spatial extent of power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

The Indian power system is divided into two regional grids, namely NEWNE and Southern grid. Each grid covers several states. 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 their demand with their 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. There are also electricity transfers between regional grids, and small exchanges in the form of cross-border imports and exports (e.g. from Bhutan). Recently, the Indian regional grids have started to work in synchronous mode, i.e. at same frequency.

States connected to different regional grids

Regional grid	**NEWNE Grid**				**Southern grid**
	Northern	**Eastern**	**Western**	**North Eastern**	**Southern**

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

States	Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh and Uttarakhand	Bihar, Orissa, West Bengal, Jharkhand and Sikkim	Gujarat, Madhya Pradesh, Maharashtra, Goa and Chattisgarh	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura	Andhra Pradesh, Karnataka, Kerala and Tamil Nadu
Union Territories	Delhi and Chandigarh	Andaman-Nicobar	Daman & Diu, Dadar & Nagar Haveli	-	Pondicherry, Lakshadweep

The NEWNE grid constitutes several states and union territories including Haryana[5]. These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations. While the power generated by own generating stations is fully owned and consumed through the respective state's grid systems, the power generated by central generating stations is shared by more than one state depending on their allocated share. Presently the share from central generating stations is a small portion of their own generation.

For the purpose of determining the emission reductions achieved by the Project the "Tool to calculate the emission factor for an electricity systems" (Version 2, EB 50) states that the "*project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints*". On this basis the Central Electricity Authority, *CO_2 Baseline Database for the Indian Power Sector - Version 5.0*[6] defines the project electricity systems within India in two regional grids. This is justified "*as electricity continues to be produced and consumed largely within the same region, as is evidenced by the relatively small volume of net transfers between the regions, and consequently it is appropriate to assume that the impacts of CDM project will be confined to the regional grid in which it is located*". The project is located in Haryana and is therefore as per the CEA's grid definitions it is within the NEWNE regional grid. Also, it is preferable to take the regional grid as project boundary than the state boundary as it minimizes effect of interstate power transactions, which are dynamic and vary widely. Considering free flow of electricity among member states and the union territory the entire NEWNE grid is considered as a single entity for estimation of baseline.

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

The project participant has chosen Option I for the calculation of the operating and build margin emission factor i.e. off-grid power plants are not being included in the calculation.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

[5] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf

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

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

For the proposed project activity, simple OM method (option a) has been chosen to calculate the operating margin emission factor ($EF_{grid, OM, y}$). However, the simple OM method 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 low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

Share of Low Cost / Must-Run (% of Net Generation)

Grid	2004-05	2005-06	2006-07	2007-08	2008-09
NEWNE	16.8%	18.0%	18.5%	19.0%	17.3%
South	21.6%	27.0%	28.3%	27.1%	22.8%
India	18.0%	20.1%	20.9%	21.0%	18.6%

Ref: CO_2 Baseline Database for the Indian Power Sector – CEA, Version 03 and 04 and 05.

Percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) = 17.94 %

The calculation above shows that the generation from low-cost/must-run resources constitutes less than 50% of total grid generation, hence usage of the **Simple OM method** in the project case is justified.

The Simple OM emission factor can be calculated using either of the two following data vintages for years(s) *y*:

- 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.

or

- 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.

The project proponent chooses the *Ex ante* option for estimating the simple OM emission factor wherein as described above 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 will be undertaken.

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

The simple OM method has been selected as justified above. The simple OM emission factor is calculated based on the net electricity generation of each power unit and a CO_2 emission factor for each power unit, as follows:

$$EF_{grid,OM,simple,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,,y}$	=	Simple operating margin CO_2 emission factor of 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	=	All power units serving the grid in year y except low-cost / must-run power units
y	=	The relevant year as per the data vintage chosen in step 3 i.e. the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)

Determination of $EF_{EL,m,y}$

The emission factor of each power unit m has been determined as follows:

$$EF_{EL,m,y} = \frac{\sum_m FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}}$$

$EF_{EL,m,y}$	=	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 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 plant / unit m in year y
y	=	The relevant year as per the data vintage chosen in step 3 i.e. the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)

Determination of $EG_{m,y}$

Since, the calculations consider only grid power plants, $EG_{m,y}$ should have been determined as per the data provided by the Central Electricity Authority (CEA) CO_2 Baseline Database for the Indian Power Sector.

In India, the Central Electricity Authority (CEA) has estimated the baseline emission factor for the power sector. This data has also been endorsed by the DNA and is the most authentic information available in the public domain. The details of same can be found on CEA website at http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm.

Step 5: Identify the group of power units to be included in the build margin

The sample group of power units *m* used to calculate the build margin consists of either:

a) The set of five power units that have been built most recently, or
b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project proponents should use the set of power units that comprises the larger annual generation.

Since in India, the installed capacity and corresponding annual generation from power plants is quite high, the sample group containing set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently comprise the sample group with the larger annual generation. Thus the sample group *m* consisting of option (b) is used for the estimation of build margin.

In terms of vintage of data, project proponents can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

The project proponent wishes to choose option 1.

Step 6: Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,OM,simple,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

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

Calculations for the Build Margin emission factor $EF_{gid, BM, y}$ is based on the most recent information available on the plants already built for sample group *m* at the time of PDD submission. The sample

group *m* 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.

Step 7: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{CO_2} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where:

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

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.
- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

As mentioned before, the CEA has calculated the baseline emission factors for various regional grids in India according to the formulas specified above. As this is the most authentic information available in the public domain. The baseline emission factor used in the calculation of baseline emissions for the proposed project activity is being referred from the same for transparency and conservativeness[7].

Project emissions

The GHG emission due to the combustion of biomass is neutralized by the sequestration that took place during the growth of the biomass crop. Further, the biomass contains negligible quantities of nitrogen and sulphur so the emission of other green house gases from the combustion of biomass is not considered. Therefore, essentially there would not be any GHG emissions due to the project activity within the project boundary.

As per paragraph 19 of AMS.I.D, since the project activity is neither a geothermal power plant nor does it have a water reservoir, the project emissions (PE_y) are estimated to be zero.

Leakage

As per AMS I.D, 'if the energy generating equipment is transferred from another activity, leakage is to be considered'. In the project activity, there is no transfer of energy generating equipment and therefore the leakage from the project activity is considered as zero. Further, according to EB 44, paragraph 50, leakage from equipment transfer from within to outside the project boundary may be excluded from consideration in SSC methodologies.

However, the only source of GHG emissions which are attributable to the project activity lying outside the project boundary will be the emissions arising during the transportation of biomass (This would also

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

not be very significant as biomass is abundantly available in the nearby vicinity, thereby not much transportation distance of biomass is involved in the project activity). The same have been estimated below:

Emissions due to the transportation of Biomass

Annual quantity of biomass required for the project activity	95,309	tonnes/year
Annual quantity of biomass transported by truck	95,309	tonnes/year
Biomass load per truck	8	Tonnes
Total no. of trips	11,914	
Max. distance between project site and collection centres	50	Km
Consumption of diesel per trip (to and fro @4km/lit)	25	Litres
Total diesel consumption (in litres)	297,840	Litres
Density of Diesel	0.83	tonnes/1000 ltr
Total diesel consumption (in tonnes)	247	Tonnes
Calorific value of diesel	0.0422786	TJ/tonne
Emission factor for diesel	69.14	tCO_2/TJ
Emissions due to transportation of biomass	**723**	**tCO_2 /year**

Similar quantum of emissions would have occurred in the baseline as well, due to the transport of coal for the grid connected power plants and FO for the onsite DG sets. Also, since emissions due to transportation of biomass are less than 10% of the baseline emissions, hence in accordance with Paragraph 12 of Attachment C to Appendix B of Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories (General guidance on leakage in biomass project activities Version 03), leakage emissions can be neglected.

To evaluate if there is a surplus of the biomass in the region of the project activity, which is not utilized, a biomass assessment study has been carried out in accordance with EB General guidance on leakage in biomass project activities (Version 03), page 4, para 18 which states that *"The project participant shall evaluate ex ante if there is a surplus of the biomass in the region of the project activity, which is not utilised. If it is demonstrated (e.g., using published literature, official reports, surveys etc.) at the beginning of each crediting period that the quantity of available biomass in the region (e.g., 50 km radius), is at least 25% larger than the quantity of biomass that is utilised including the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions."*

The biomass requirement for the project activity is 95,309 MT/year. The biomass assessment study conducted for Star Wire (India) Vidyut Pvt. Ltd. concludes that the biomass generation (Mustard husk, Mustard stick, Paddy Waste, Saw Dust and trees and bushes) in the region is 520852 MT/year and the consumption of the same is 313743 MT/year. Thus, the surplus biomass as a percentage of consumption is found to be more than the figure of 25% required as per the guidance.

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

Data / Parameter:	**$EF_{grid,OM,y}$**

Data unit:	tCO_2/MWh
Description:	Ex-ante Simple operating margin for calculation of grid emission factor
Source of data used:	CO_2 Baseline Database for the Indian Power Sector Version 5.0 published by Central Electricity Authority (CEA)
Value applied:	1.0050
Justification of the choice of data or description of measurement methods and procedures actually applied :	CEA is a statutory organisation under Ministry of Power which collects and records the data concerning the generation, transmission, trading, distribution and utilization of electricity. The ex-ante simple operating margin has been calculated as the full generation weighted average for most recent three years using data provided by CEA in accordance with the "Tool to Calculate the Emission Factor for an Electricity System", Version 2 by UNFCCC
Any comment:	This value is determined ex-ante and will be fixed for the crediting period.

Simple Operating Margin Estimation for NEWNE Grid	
OM, 2006-07	1.0085 tCO2 / MWh
OM, 2007-08	0.9999 tCO2 / MWh
OM, 2008-09	1.0066 tCO2 / MWh
Average OM ($EF_{grid,OM,y}$)	1.0050 tCO_2 / MWh

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Ex-ante Build margin for calculation of ex-ante grid emission factor
Source of data used:	CO_2 Baseline Database for the Indian Power Sector Version 5.0 published by Central Electricity Authority (CEA)
Value applied:	0.6752
Justification of the choice of data or description of measurement methods and procedures actually applied :	CEA is a statutory organisation under Ministry of Power which collects and records the data concerning the generation, transmission, trading, distribution and utilization of electricity. The ex-ante build margin has been calculated based on the most recent information available on plants using option 1 in step 4 in the "Tool to Calculate the Emission Factor for an Electricity System", Version 2 by UNFCCC for the year 2007-08.
Any comment:	This value is determined ex-ante and will be fixed for the crediting period.

Data / Parameter:	**EF_{CO2} / $EF_{grid,CM,y}$**
Data unit:	tCO_2/MWh
Description:	Ex- ante CO_2 emission factor for the NEWNE regional grid
Source of data used:	CO_2 Baseline Database for the Indian Power Sector Version 5.0 published by Central Electricity Authority (CEA)
Value applied:	0.8401
Justification of the choice of data or description of measurement methods and procedures actually applied :	CEA is a statutory organisation under Ministry of Power which collects and records the data concerning the generation, transmission, trading, distribution and utilization of electricity. Combined margin has been calculated giving equal weightage ($w_{OM} = 0.5$ & $w_{BM} = 0.5$) to operating and build margin in accordance with the "Tool to Calculate the Emission Factor for an Electricity System", Version 2 by UNFCCC

Combined Margin Estimation for NEWNE Grid

	Average OM ($EF_{grid,OM,y}$) 1.0050 tCO_2 / MWh BM, 2008-09 ($EF_{grid,BM,y}$) 0.6752 tCO_2 / MWh Combined Margin ($EF_{grid,CM,y}$) 0.8401 tCO_2 / MWh
Any comment:	This value is determined ex-ante and will be fixed for the crediting period.

Data / Parameter:	**$SFC_{biomass,i}$**
Data unit:	ton / MWh
Description:	Biomass consumption per unit of electricity generated by the Power Plant
Source of data used:	DPR (The figure has been taken from HERC tariff Order)
Value applied:	1.36
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the specific fuel consumption of biomass considered by the Central Electricity Regulatory Commission (CERC) in its order for determination of tariff for biomass based power plants
Any comment:	This value is being fixed ex-ante for the crediting period

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions (BE_y)

Parameter	Data Unit	Data Value	Data Source
Plant Capacity	MW	10	DPR
Plant Load Factor	%	80%	DPR
Number of days of operation in a year	Days	365	DPR
Number of hours of operation in a day	Hours	24	DPR
Gross energy Generation (GWh)	MWh/yr	70080	Calculated
Auxiliary consumption (10%)	MWh/yr	7008	Calculated
Net Energy Generation ($EG_{BL,y}$)	MWh/yr	63072	Calculated
Baseline emission factor	tCO_2/MWh	0.8401	CEA Database Ver 5.0

According to small scale methodology AMS I.D (Version 16), if the project activity uses fossil fuel, the net electricity generation should be calculated by way of two approaches and the lower of the two values should be considered as net electricity generation to calculate emission reductions**.**

Approach 1 according to AMS-I.D. (Version 16)

If fossil fuel is used along with biomass, the electricity generation metered should be adjusted to deduct electricity generation from fossil fuels using the specific fuel consumption and the quantity of fossil fuel consumed

$EG_{FF,Gross,y} = FC_{FF} / SFC_{FF}$ MWh

$EG_{FF,Gross,y} = 0 / SFC_{FF}$ MWh

$= 0$ MWh

$EG_{FF,Aux,y}$ = $EG_{FF,Gross,y}$ X $EG_{aux,y}$ (%) MWh
= 0 X 10% MWh
= 0 MWh

$EG_{FF,y}$ = $EG_{FF,Gross,y}$ - $EG_{FF,Aux,y}$
= 0 – 0 = 0 MWh

$EG_{ay,y}$ = $EG_{net,y}$ – $EG_{FF,y}$
= 63072 – 0 = 63072 MWh

Approach 2 according to AMS-I.D. (Version 16)

The amount of electricity generated calculated using specific fuel consumption and amount of each type of biomass fuel used

$$EG_{biomass,gross,i,y} = FC_{biomass,i,y} \Big/ SFC_{biomass,i}$$

$EG_{biomass,gross,y}$ = 95309 / 1.36 MWh
= 70080 MWh

$EG_{biomass,Aux,y}$ = $EG_{biomass,Gross,y}$ X $EG_{aux,y}$ (%) MWh
= 70080 X 10% MWh
= 7008 MWh

$$EG_{biomass,i,y} = EG_{biomass,gross,i,y} - EG_{biomass,aux,i,y}$$
= 70080 – 7008 = 63,072

$$EG_{biomass,y} = \sum EG_{biomass,i,y}$$

$EG_{PJ,y}$ = MIN ($EG_{a,y}$, $EG_{b,y}$) = 63072 MWh

$BE_y = EG_{PJ,y} * EF_{CO2}$ = 63072 * 0.8401 = 52,986 tCO_2

Leakage (LE_y)

Since emissions due to transportation of biomass are less than 10% of the baseline emissions, in accordance with Paragraph 12 of Attachment C to Appendix B of Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, leakage emissions can be neglected.

Further, as per AMS I.D, 'if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered', in the project activity, there is no transfer of energy generating equipment and therefore the leakage from the project activity is considered as zero.

Project activity emissions (PE_y)

As there would be no emissions due to the implementation of the project, the project emissions are estimated to be zero.

Emission reductions (ER_y)

Baseline Emissions (BE_y)	52,986	tCO_2/yr
Project Activity Emissions (PE_y)	0	tCO_2/yr
Leakage (LE_y)	0	tCO_2/yr
Emission Reductions (ER_y) = BE_y - PE_y - LE_y	**52,986**	**tCO_2/yr**

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	52,986	0	52,986
Year 2	0	52,986	0	52,986
Year 3	0	52,986	0	52,986
Year 4	0	52,986	0	52,986
Year 5	0	52,986	0	52,986
Year 6	0	52,986	0	52,986
Year 7	0	52,986	0	52,986
Year 8	0	52,986	0	52,986
Year 9	0	52,986	0	52,986
Year 10	0	52,986	0	52,986
TOTAL	**0**	**529,860**	**0**	**529,860**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{PJ,y}$**
Data unit:	MWh/year
Description:	Net electricity exported to by project activity in year y
Source of data to be used:	Invoices raised by SWIVPL based on the monthly Joint meter readings taken in the presence of grid and SWIVPL officials
Value of data	63,072
Description of measurement methods and procedures to be applied:	The electricity exported by the project activity would be monitored through energy meters installed at the interconnection point of accuracy class 0.2s/0.5s. The electricity imported from the grid would be subtracted from the electricity exported to the grid to obtain the net electricity exported. Invoices would be raised by SWIVPL on the basis of this figure.
QA/QC procedures to be applied:	Main and check meters would be installed at the interconnection point. In case main meter goes out of operation or shows erroneous reading then the check meter reading would be used for billing and calculation of emission reduction purposes. The energy meters would be calibrated annually.
Any comment:	The data will be kept for two years after the end of the crediting period or the last

	issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	**$FC_{biomass,PJ,y}$**
Data unit:	MT/year
Description:	The quantity of biomass combusted in the project activity during the year y.
Source of data to be used:	Plant records/Log books
Value of data	95,309
Description of measurement methods and procedures to be applied:	The quantity of biomass fed into the boiler will be measured using a belt conveyor/load cell and recorded in log book.
QA/QC procedures to be applied:	The weighing system would be calibrated annually to ensure the accuracy of the measurement. The amount of biomass consumed will be cross checked by the purchase details and stock inventory for biomass.
Any comment:	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	**$NCV_{biomass,y}$**
Data unit:	kcal/kg
Description:	Net calorific value of biomass combusted during the year y
Source of data to be used:	Test reports
Value of data	Shall be ascertained on annual basis
Description of measurement methods and procedures to be applied:	NCV analysis from an authorized laboratory on an annual basis.
QA/QC procedures to be applied:	The analysis of biomass will be carried out by an authorized testing agency.
Any comment:	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	**$FC_{FF,y}$**
Data unit:	MT/year
Description:	The quantity of fossil fuel utilized for power generation in the project activity in year y
Source of data to be used:	Plant records and log books
Value of data	0
Description of measurement methods and procedures to be applied:	The quantity of coal fed to the boiler will be measured using a belt conveyor/load cell and recorded in log book.
QA/QC procedures to be applied:	The weighing system would be calibrated annually to ensure the accuracy of the measurement. The amount of coal consumed will be cross checked by the purchase details and stock inventory for coal.
Any comment:	The data will be kept for two years after the end of the crediting period or the last

	issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	Demonstration of Surplus Biomass
Data unit:	MT
Description:	Surplus biomass in region
Source of data to be used:	Biomass assessment study
Value of data	-
Description of measurement methods and procedures to be applied:	Biomass surplus will be demonstrated at the beginning of each crediting period in accordance with Attachment C to Appendix B of "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories"- "General guidance on leakage in biomass project activities", Version 03 (Paragraph 18). If the biomass assessment study demonstrates that the quantity of available biomass in the region is at least 25% larger than the quantity of biomass that is utilized including the project activity then this source of leakage will be neglected, otherwise the leakage shall be estimated and deducted from the emission reductions.
QA/QC procedures to be applied:	-
Any comment:	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

B.7.2 Description of the monitoring plan:

Star Wire (India) Vidyut Pvt. Ltd. has designed a comprehensive monitoring plan as per the guidance provided in the monitoring section of AMS.I.D Version 16.

Description of monitoring plan

As per the requirement of monitoring methodology, the following parameters will be monitored:

- Net Electricity exported
- Quantity of biomass used
- Calorific Value of biomass used

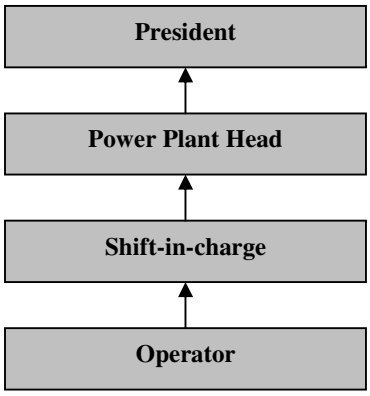
There will be two energy meters (main and check) installed at the interconnection point to record the energy exported to and imported from the grid by the project activity. In case the main meter goes out of operation or shows erroneous reading then the check meter reading would be used for billing and calculation of emission reduction purposes. The net electricity would be calculated as the difference of the energy exported to and imported from the grid and would be used for the calculation of emission reductions of the project activity. As far as electricity is concerned, the monitoring and verification system would mainly comprise of these meters. The energy meters will be calibrated annually so that the accuracy of measurement can be ensured at all times.

The quantity of rice husk being fed into the boiler will also be monitored using the belt conveyor system/load cell. Input quantity of coal shall be monitored as and when used.

To ascertain the Quality Control and Quality Assurance of the monitored parameters, Star Wire (India) Vidyut Pvt. Ltd. has developed an internally accepted set of standards that would ensure accuracy of all monitoring and control functions. In accordance with this set of standards, the following operational and management structure has been adopted:

The electricity generation and auxiliary consumption of the plant would be recorded by shift-in-charges on a daily basis. The quantity of biomass and coal consumed would also be monitored on a daily basis. The power plant head would ensure that the data is properly collected and stored electronically/paper. The monthly report would be prepared by Shift Engineer by aggregating the daily readings and the same will be verified by the power plant head. Any discrepancy observed in the readings would be handled responsibly. The power plant personnel are qualified technical professionals. All the shift in-charges are trained and experienced diploma holders. Need based training of employees associated with the project activity will be carried out as and when felt necessary.

CDM Committee Organogram



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 application of baseline and monitoring methodology: 20/11/2010

Name of person/entity determining the baseline: M/s Star Wire (India) Vidyut Pvt. Ltd.

The entity is also a project participant listed in Annex 1 of this document.

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:

01/04/2011 (Expected date as the project proponent has not committed to any major financial expenditure for the project activity as of date). Hence, this date will be updated as and when firm financial commitment is undertaken by the project proponent.

According to EB 41, *"the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. This, for example, can be the date on which contracts have been signed for equipment or construction/operation services required for the project activity*".

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

20 years from the starting date of project activity.

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:

01/04/2012 or the date of registration, if registration occurs prior to or after the specified date

However, the project participant hereby confirms that the crediting period will not commence prior to the date of registration

C.2.2.2. Length:

10 years

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 Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification[8] vide S.O.1533 dated 14/09/06 has listed a set of industrial activities in the Schedule for which new projects or modernization/expansion projects will require environmental clearance and will have to conduct an Environmental Impact Assessment(EIA) study. Star Wire (India) Biomass Pvt. Ltd's project activity requires EIA to be conducted according to this notification. Hence, the project proponent conducted an Environmental Impact Assessment study. Further, the project proponent has also obtained the following approvals from various authorities:

- Pollution Control Department
- Irrigational Department
- Forest Department
- Ground water permission

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:

[8] Reference : http://envfor.nic.in/legis/eia/so1533.pdf

The Project Proponent has conducted Environmental Impact Assessment (EIA) and the study concludes that there are no adverse impacts on the environment due to the project activity. Various measures have been taken by the project proponent to avoid any pollution by

- Particulate matter and gases
- Water pollution
- Thermal pollution
- Noise pollution

SECTION E. Stakeholders' comments

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

The stakeholders are defined as the public, including individuals, groups or communities, affected, or likely to be affected, by the proposed CDM project activity. Identified stakeholders were requested personally by the project proponent to participate in the stakeholder consultation meeting to discuss any potential concerns regarding the project activity. In this regard, an invitation letter comprising a brief summary of the project and the purpose of the said consultation was sent to them.

Subsequently, a meeting was organized by Star Wire (India) Vidyut Pvt. Ltd on 15/10/2010. Representatives from Star Wire (India) Vidyut Pvt. Ltd. facilitated the meeting. Stakeholders were explained the details of the project activity and were given an overview of the greenhouse gases emission, impact of GHG and CDM etc. They were apprised of how the project activity would lead to GHG emission reduction and contribute to sustainable development in the region. Following this, certain concerns were raised by the stakeholders. These have been recorded and are available on request.

E.2. Summary of the comments received:

Considering that the project activity aids in the conserving the natural resource and aids in providing employment opportunities to the local people, the stakeholders were very appreciative of the project activity.

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

There were no adverse comments received from the stakeholders and the net beneficial effects of the project activity were acknowledged by the stakeholders present.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Star Wire (India) Vidyut Pvt. Ltd.
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Telephone:	011-29832650 - 52
FAX:	011-29832542
E-Mail:	varuntodi@gmail.com
URL:	-
Represented by:	-
Title:	
Salutation:	Mr.
Last Name:	Todi
Middle Name:	
First Name:	Varun
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	varuntodi@gmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

Selection of Grid boundary

In the approved consolidated methodology ACM0002, the following guideline is given for the selection of grid. *"Where DNA guidance is not available, in large countries with layered dispatch systems (e.g. state/provincial/regional /national) the regional grid definition should be used. A state/provincial grid definition may indeed in many cases be too narrow given significant electricity trade among states/provinces that might be affected, directly or indirectly, by a CDM project activity"*.

As stated earlier, the electrical transmission system in India is divided into two regions namely NEWNE Region and Southern Region. The NEWNE regional grid covers many states including Himachal Pradesh where the project activity is located. Therefore NEWNE grid region is selected as grid boundary to estimate the baseline emission factor.

Baseline Emission Factor (Combined Margin)

The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Combined Margin emission factor for the NEWNE grid, the details of which (as explained in the PDD, section B.6.1) are available at the following website.
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

The procedures and formulas used for estimation of the baseline factor and the assumptions made have also been detailed in there.

Combined Margin Estimation for NEWNE Grid (tCO_2 / MWh)	
OM, 2006-07	1.0085
OM, 2007-08	0.9999
OM, 2008-09	1.0066
Average OM ($EF_{grid, OM,y}$)	**1.0050**
BM, 2008-09 ($EF_{grid, BM, y}$)	**0.6752**
Combined Margin (EF_{CO2})	**0.8401**

Annex 4

MONITORING INFORMATION

The monitoring plan has been already explained in section B.7.2.

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