PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-PDD)
Version 04.1

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	**Biomass based power generation project in Maharashtra, India**
Version number of the PDD	05.5
Completion date of the PDD	06/05/2014
Project participant(s)	M/s. A.A. Energy Limited
Host Party(ies)	India
Sectoral scope(s) and selected methodology(ies)	**Sectoral Scope: 1** **Selected Methodology:** AMS I D – "Grid connected renewable electricity generation", Version – 15 (October 30, 2009).
Estimated amount of annual average GHG emission reductions	49,766 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The project proponent M/s. A.A. Energy Limited (AAEL) is setting up an eco-friendly 10 MW biomass based power generation project at Desaiganj Wadsa in Gadchiroli district of Maharashtra. The proposed small scale project will utilise the surplus biomass residues primarily from rice husk available locally to generate power through sustainable means without causing any negative impacts on the environment.

The generated power, after meeting the auxiliary power requirements, will be sold to Tata Power Trading Company Limited (TPTCL), the net billable power will be metered at Maharashtra State Electricity Distribution Company Limited's (MSEDCL's) 132 kV substation which is at a distance of 16 km from the project site in Brahmapuri. This project in a small way will contribute to bridge the huge demand supply gap in the state of Maharashtra estimated at 13.13% to 29.67%[1]. This whole process will support climate change mitigation as it would lead to an emission reduction of 497660 tonnes of CO_2e over the chosen crediting period.

The implementation of this project activity would contribute to the sustainable development of the region in the following ways as stipulated by the Ministry of Environment and Forests (MoEF) in the interim approval guidelines for CDM projects –

Social well-being

The project will generate large employment opportunities for the rural population in that region during the construction phase of the project activity and will continue to generate employment opportunities on a regular basis which will include collection, processing and transportation of biomass, as well as in the operation of the plant creating additional employment opportunities for the local suppliers. The project is being set up in Gadchiroli district, which charts top in the 10 lowest Districts in Maharashtra State in terms of growth and human development index as defined by Government of Maharashtra – Industry Energy and Labour Department[2].

Economic well-being

The commercial values to the agricultural residues will improve the income levels of the farmers and thereby improving their economic stability. This might lead to setting up of small industries, shops, hotels thereby providing business opportunities for local stakeholders, manufacturers and contractors. The project activity will thus indirectly contribute to the creation of local infrastructure facilities and also some basic civic amenities.

Environmental well-being

The proposed project activity effectively utilises available surplus agro biomass residues, primarily rice husk in the region to generate power in a sustainable manner. Thereby reducing the dependence on fossil fuel based generation units and as there are no associated emissions with this project it contributes to the reduction of green house gases (GHG) emissions.

[1] Western Region Power Committee annual report 2007 – 08, Chapter 2

[2] Refer page 27: http://www.sicomindia.com/site/Policy/GRIP3007.pdf

Technological well-being
The proposed project activity utilises agro biomass residues for power generation, this will encourage the adoption of clean technologies for power generation and would bring participation from the private sector to promote such technologies. The project in a small way will also contribute to energy security in the country.

A.2. Location of project activity
A.2.1. Host Party(ies)
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Host Party- India

A.2.2. Region/State/Province etc.
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State- Maharashtra

A.2.3. City/Town/Community etc.
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District: Gadchiroli
Tehsil: Desaiganj Wadsa

A.2.4. Physical/ Geographical location
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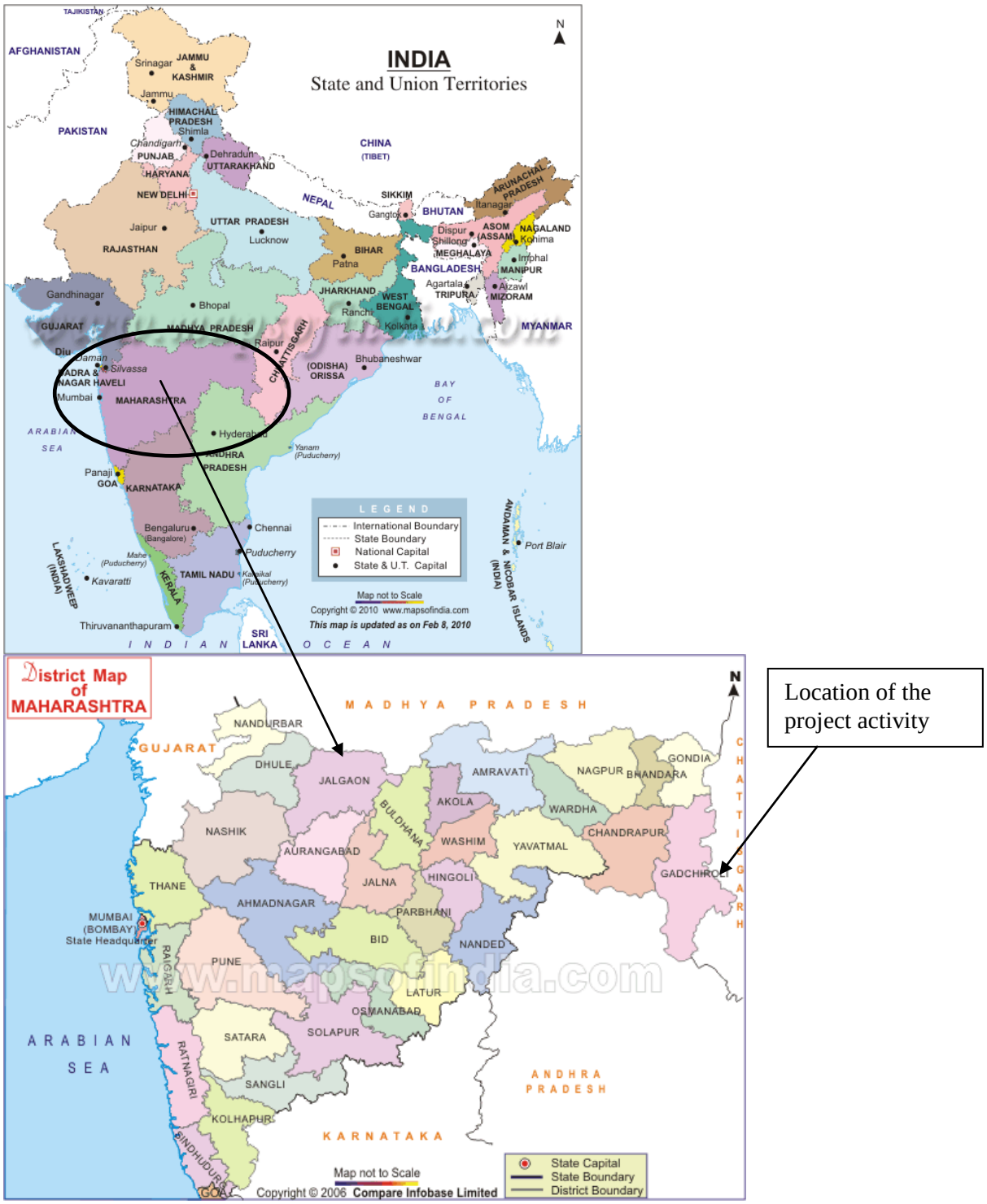
The project is located at Desaiganj Wadsa in Gadchiroli district which is classified under backward industrial district as per package scheme of Government of Maharashtra 2007, and hence industrial growth is highly awaited. The nearest town Desaiganj Wadsa is 7 km from the project site, the nearest railway station is at Desaiganj Wadsa. The nearest airport is at Nagpur, which is 160 km from the project site is accessible from NH-6 Nagpur – Raipur National Highway. The geographical co-ordinates of the project activity are $20^{o}37'22''$ North to $79^{o}57'32''$ East.



(The district map of Maharashtra indicating the location of the project activity)

A.3. Technologies and/or measures

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Type 1 – Renewable energy projects
Category – Grid connected renewable electricity generation – AMS 1.D./Version 15 (October 30, 2009)

Technology/Measure
This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.

The proposed project activity is a biomass based power generation project and it will supply electricity to TPTCL. The generated power after meeting the plant's auxiliary power requirements will be sold to TPTCL. The net saleable/billable power will be metered at MSEDCL substation in Brahmapuri.

Technical description of the project activity
The process of power generation is by rankine cycle. Steam generated at high a pressure of 66 kg/cm^2 and 490^{o}C will be supplied to an extraction cum condensing turbine generator (TG) set at around 64 kg/cm^2 and 480^{o}C. Fuel will be supplied to boiler and entire steam generated will be passed through the 10 MW steam turbine generator (STG) for generating of power. Auxiliaries of the biomass power plant will be supplied in-house generated power & balance of power generated will be synchronized and exported to the grid.
The biomass power plant STG has been designed with a bleed at 4 kg/cm² for supplying steam to de-aerator. Balance steam for maximizing power generation will be condensed in the surface condenser. The high pressure steam in small quantities, required for steam jet air ejector and gland sealing will be tapped from the main steam line through Pressure Reducing & De-Super Heating (PRDSH) station.

The power generated at 11 KV from the 10 MW STG set will be stepped down to 415 V for meeting all power requirements of auxiliaries. The balance of power generated will be synchronized with MSEDCL grid stepped up to 132 KV level and transported to a substation of MSEDCL at 16 km distance, for export purposes.

The boiler of 46 TPH will be designed for multi fuel operations and will have a travelling grate design. However the primary fuel source used would be rice husk and the plant will operate throughout the year on rice husk only. The electro static precipitator (ESP) will be installed as a part of the boiler, along with reinforced cement concrete (RCC) chimney, to limit the emissions well below 100 mg/Nm^3, stipulated norm by the Pollution Control Board. The plant controls will be digital control system (DCS) based to ensure most efficient operations & monitoring of operating parameters. The Technical details of the power plant are as tabulated below –

Boiler	
Type	Travelling Grate
Boiler capacity (100 % load) / Steam Flow rate	46 TPH
Steam pressure at super heater outlet	66 kg/cm^2
Steam temperature at super heater outlet	490^{o}C
Turbo Generator	

Type	Extraction cum Condensing
Steam pressure at the TG inlet	64 kg/cm^2
Steam temperature at the TG inlet	480^{o}C
Frequency	50 Hz
Power Evacuation	
Grid Voltage	132 kV
MSCDCL substation	11/132 kV in Brahmapuri
Energy Production (For Optimum year)	
Gross Energy	10 MW
Auxiliary Consumption (10%)	1 MW
Voltage level	415 V (for auxiliary consumption)
Net Energy Export to Grid	9 MW

Conformity for the project to remain within small scale limits throughout the crediting period is clearly demonstrated by the biomass assessment study carried out by Mitcon Consultancy Services Ltd., a third party appointed by the PP[3]. Based on which the Maharashtra Energy Development Agency (MEDA) has issued an in principle clearance for setting up the proposed project[4].

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	M/s. A.A. Energy Limited (Private Entity)	No

A.5. Public funding of project activity

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There is no public funding involved in this project activity.

A.6. Debundling for project activity

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According to paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities (FCCC/CP/2002/7/Add.3), a small-scale project is considered as a debundled component of a large project activity if there is a registered small-scale activity or an application to register another small-scale activity:

- With the same project participants

[3] Refer Biomass Assessment Study Report dated February 8, 2008 Doc. No.GPD/BAS/07-08/031(F)
[4] Letter dated April 30, 2008 Ref No. PGN – II/BPP – 101/08 – 09/ from MEDA to AAEL

- In the same project category and technology
- Registered within the previous two years; and
- Whose project boundary is within 1km of the project boundary of the proposed small scale activity

None of the above applies to the proposed project activity and the project participant has not registered or applied for registration of another project. Therefore the proposed project is not a debundled component of a larger CDM project activity.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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Title: Grid connected renewable electricity generation
Reference: AMS 1.D./Version 15 (October 30, 2009)

B.2. Project activity eligibility

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The project activity is a 10 MW biomass based power generation project, since the project generates and exports renewable electricity to the grid system and the capacity of the project activity is well below the qualifying limit of 15 MW. Hence AMS 1.D./Version 15 (October 30, 2009) 'grid connected renewable electricity generation' is applied for this project activity.

The following table justifies the use of the selected approved consolidated baseline and monitoring methodology (AMS I.D) –

Applicability Conditions in the AMS I.D	**Project activity vis-à-vis applicability conditions**
This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.	The project activity is installation of a new grid connected 10 MW biomass based power project.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/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.	Project activity doesn't involve installation of hydro power plant. It is an installation of a new grid connected 10 MW biomass based power project.
If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW	The project activity has renewable component only. It

for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel[5], the capacity of the entire unit shall not exceed the limit of 15MW.	doesn't involve any co-firing of fossil fuel. Also the capacity of the project activity is 10 MW which is well below the eligibility limit of 15 MW.
Combined heat and power (co-generation) systems are not eligible under this category.	The project activity is not a combined heat and power (co-generation) 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 distinct from the existing units.	Project activity is not a capacity addition to an existing facility.
Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small-scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.	No retrofitting or modification takes place in the project activity.

The project activity is meeting all the eligibility criteria for the selected methodology. Thus applying AMS I.D for the project activity is justified.

B.3. Project boundary

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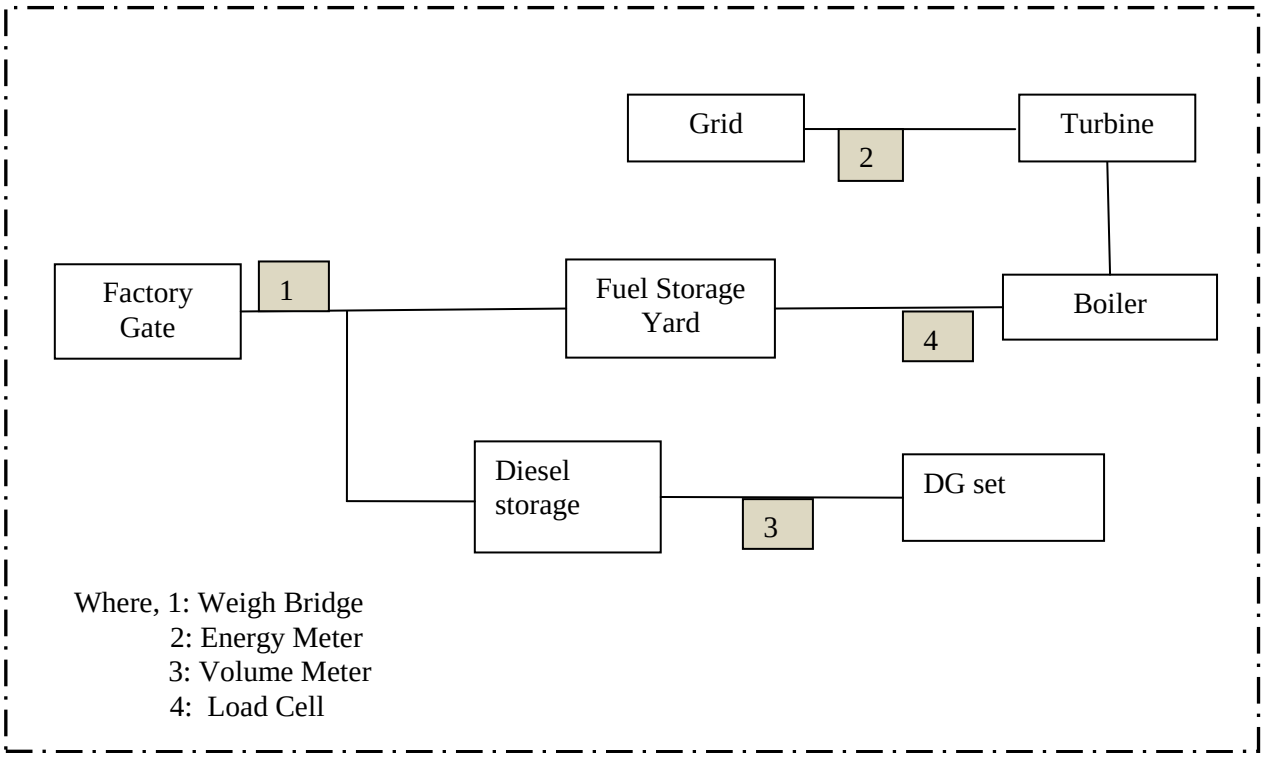
According to AMS I.D/Version 15 (October 30, 2009) para 7 "the physical, geographical site of the renewable generation source delineates the project boundary".

The project boundary includes the entire power plant site including all machinery & equipments required for power generation in this plant and biomass storage area. Project boundary is illustrated in the following diagram.

[5] Co-fired system uses both fossil and renewable fuels.



(Project Boundary)

B.4. Establishment and description of baseline scenario

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As per AMS I.D./Version 15 (October 30, 2009) the baseline is the MWh produced by the renewable generating unit multiplied by an emission coefficient (measured in tCO_2e/MWh) calculated in a transparent and conservative manner as:

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' Version 01.1 Annex 12 EB 35.

OR

The weighted average emissions (in tCO_2e/MWh) 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.

Baseline for the project activity is power generated from renewable energy source multiplied by the grid emission factor of NEWNE grid calculated in transparent and conservative manner.

Option (a) has been considered to calculate the grid emission factor as per the 'Tool to calculate the emission factor for an electricity system' version 01.1 Annex 12 EB 35 as per the methodology as data is available from an official source.

Baseline Methodology Procedure

Project participants shall apply the following six steps:

STEP 1: Identify the relevant electric power system.

STEP 2: Select an operating margin (OM) method.

STEP 3: Calculate the operating margin emission factor according to the selected method.
STEP 4: Identify the cohort of power units to be included in the build margin (BM).
STEP 5: Calculate the build margin emission factor.
STEP 6: Calculate the combined margin (CM) emissions factor.

STEP 1: Identify the relevant electric power system

The tool defines the electric power system as the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. Keeping this into consideration, the CEA[6] has classified the grid system into two parts, Southern Region grid and NEWNE grid. The NEWNE grid comprises of –

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

Since the project supplies electricity to the Western Region grid, which is a part of NEWNE grid, emissions generated due to the electricity generated by the NEWNE grid as per CM calculations will serve as the baseline for this project.

STEP 2: Select an operating margin (OM) method

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

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

Any of the four methods can be used. 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.

	2005-06	2006-07	2007-08
NEWNE	18.0%	18.5%	19.0%
South	27.0%	28.3%	27.1%

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

India	20.1%	20.9%	21.0%

(Source: http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf)

The above table 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 only 19.0% which is much lesser than 50% of the total generation. Thus, Simple OM method can be used for calculating the emission factor.

STEP 3: Calculate the operating margin emission factor according to the selected method
For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- Ex ante option: 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, or
- Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required for calculating 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 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.

Method adopted for Simple OM in the project activity
In the project activity, (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission has been considered. The data is published annually by the CEA.
It is confirmed that ex-ante vintage is considered in the project activity and cannot be changed during the crediting period.

Parameter	Value (tCO_2/ MWh)	Source
Simple OM, 2005-06	1.02	The OM is based on ACM0002 as calculated in CEA database for grid emission factor (Version 4). http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Simple OM, 2006-07	1.01	
Simple OM, 2007-08	1.00	
Simple OM, average	1.01	

STEP 4: Identify the cohort of power units to be included in the build margin (BM)
The value of the data has been taken from the data published by CEA as referred in earlier step. The details of the key assumptions considered to calculate the figure can be found in the User Guide of the same.

Project participants can choose one of the following two options:

Option 1

Calculate the Build Margin emission factor $EF_{BM,y}$ ex-ante based on the most recent information available on plants already built for sample group m at the time of PDD submission. The sample group m consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

Option 2
For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually ex-post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated ex-ante, as described in option 1 above. The sample group m consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

STEP 5: Calculate the build margin emission factor ($EF_{grid,BM,y}$)
Option 1 as described above is chosen in the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

As per the CEA CO_2 Baseline Database, the BM for the 2007-08 has been calculated to be $EF_{grid,BM,y}$ = 0.60 tCO2e/MWh

STEP 6: Calculate the combined margin (CM) emissions factor ($EF_{grid,CM,y}$)
The CM can be calculated as per the following:

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

Where,
$EF_{grid,OM,y}$ = Build Margin CO_2 emission factor in the year y (tCO_2/MWh)
$EF_{grid,BM,y}$ = Operating Margin CO_2 emission factor in the year y (tCO_2/MWh)
W_{OM} = Weighting of operating margin emission factor (%)
W_{BM} = Weighting of build margin emission factor (%)
Where:
The default weights for OM and BM are as follows: w_{OM} = 50% and w_{BM} = 50%

In the project activity, **combined margin has been chosen as the baseline emission factor for grid emission factor**. The value chosen is taken from relevant official sources and is publicly available[7].

Parameter	Value (tCO_2/ MWh)
OM, Operating Margin	1.01
BM, Build Margin	0.60
CM, Combined Margin	0.805

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

Thus, the CM emissions factor ($EF_{grid,CM,y}$) for the project has been calculated to be $EF_{grid,CM,y}$ = 0.805 tCO_2/MWh and is fixed ex-ante for the entire crediting period.

Source: Baseline Carbon Dioxide Emissions from Power Sector Version 04 published by the CEA , India[8]. For further details on baseline study please refer to Annex 3.

B.5. Demonstration of additionality

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The project reduces anthropogenic emission of greenhouse gases by source below those that would have occurred in absence of the CDM project activity. As per decision 17/cp.7 Para 43, a CDM project is additional if anthropogenic emission of GHG by source are below those that would have occurred in the absence of the CDM project activity.

CDM Consideration:

As per the **GUIDANCE ON THE DEMONSTRATION AND ASSESSMENT OF PRIOR CONSIDERATION OF THE CDM (Version 03)**–

New Project Activities

1. *The Board decided that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host 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. Such notification is not necessary if a PDD has been published for global stakeholder consultation or a new methodology proposed to the Executive Board for the specific project before the project activity start date.*
2. *The UNFCCC secretariat will maintain a publicly available list of such notifications*[9].
3. *When validating a project activity with a start date on or after 2 August 2008, DOEs shall ensure by means of confirmation from the UNFCCC secretariat that such a notification had been provided. If such a notification has not been provided, the DOE shall determine that the CDM was not seriously considered in the decision to implement the project activity.*
4. *Additionally for project activities for which a PDD has not been published for global stakeholder consultation or a new methodology proposed or request for revision of an approved methodology is requested, every subsequent two years after the initial notification the project participants shall inform the UNFCCC secretariat of the progress of the project activity.*

Following demonstrates the serious consideration of CDM benefits by PP in implementation of the project under discussion-

AAEL has envisaged to develop the proposed biomass based power generation project as a CDM project activity from the conceptualisation stage itself, the chronology of events demonstrating serious consideration of CDM is tabulated as –

Sl. No.	Document	Date
1	No Objection Certificate for setting up a 10 MW biomass based power plant from municipal council, Desaiganj (No.	10/03/2008

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

[9] Proposed CDM project can be located at http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

	KV/NPDC/NV/75/- 2008)	
2	Biomass assessment report	March 2008
3	Project DPR	April 2008
4	Board resolution	12/05/2008
5	Power Purchase Agreement	24/05/2008
6	Consent to establish from Maharashtra Pollution control board (Consent no. BO/RO (P & P)/ CC-308)	24/06/2008
7	Letter of appointment of CDM consultant	06/07/2008
8	**Boiler Purchase Agreement (Taken as project start date)**	**20/08/2008**
9	Purchase order of 10 MW turbine	20/09/2008
10	CDM intimation letter to MoEF & UNFCCC	19/09/2008
11	Sanction of term loan from IREDA (Ref: 221/2488/GMG/2008/IREDA/8234)	18/12/2008
12	Environment clearance from Government of Maharashtra (No.2008/356/CR 50/TC-1)	22/01/2009
13	Meeting of National CDM Authority	28/01/2009
14	Agreement between MEDA (Maharashtra Energy Development Agency) and AA Energy Ltd.	12/03/2009
15	Host country approval	01/05/2009
16	PDD webhosting	19/05/2009

As per the guidance on demonstration and assessment of prior consideration of CDM from EB 49[10] annex 22, AAEL has notified both CDM EB of UNFCCC and MoEF vide letters dated 19/09/2008[11] about their plans to develop the proposed project activity under CDM. All the aforementioned documentary evidences clearly demonstrate that the proposed project activity has been conceived as a CDM project activity by the PP.

The additionality for the proposed project has been done as per "Non-binding best practice examples to demonstrate additionality for SSC project activities Annex 34/ EB 35". As Investment barriers are found more prominent for this project, investment analysis has been carried out as per Guidance on the Assessment of Investment Analysis version 03 EB 51 Annex 58"[12].

Investment Analysis

For the purpose of carrying out an investment analysis the prime financial indicator that has been used is the IRR of the project activity. The Project IRR is one of the most commonly used tools to assess the feasibility and viability of the projects and the Weighted Average Cost of Capital (WACC) is the suitable benchmark. WACC is calculated by multiplying the cost of each capital component by its proportional weight and then summing:

$$WACC = \frac{E}{V} * Re + \frac{D}{V} * Rd * (1 - Tc)$$

Where;
Re = cost of equity
Rd = cost of debt
E/V = percentage of financing that is equity

[10] http://cdm.unfccc.int/EB/049/eb49_repan22.pdf
[11] Shall be provided to DOE for perusal
[12] http://cdm.unfccc.int/EB/051/eb51_repan58.pdf

D/V = percentage of financing that is debt
Tc = tax rate

In the project activity, following set of values has been used to estimate WACC.

Parameter	Details	Value	Source
Re	Cost of equity	21%	Estimated based on market indices as described below.
Rd	Cost of debt	11%	Project DPR
E/V	Percentage of financing that is equity	30%	As per the loan document and project DPR
D/V	Percentage of financing that is debt	70%	As per the loan document and project DPR
Tc	Corporate tax rate	33.99 %	IT Act (2006-07)

Estimation of cost of equity

The para 12 of the Guidance also suggests that in cases where the project can be developed by an entity other than the project participant, the benchmark should be based on publicly available sources which can be validated by DOE. It further states that such benchmarks may include local lending and borrowing rates, equity indices or benchmarks determined by relevant national authorities.

Considering the above, the project participant has considered the benchmark based on equity indices. Cost of equity has been estimated based on Capital Asset Pricing Model (CAPM). As per the model, Cost of Equity or Required Return on Equity can be estimated as below –

Re = Rf + Beta x (Market Return – Risk Free Return)

The Capital Asset Pricing Model (CAPM) is a well accepted methodology for estimating the expected return on equity. As per CAPM, the required return on equity investment is the return of risk free security plus beta times the difference between market return and risk free return. CAPM is based on the portfolio theory of finance in which risks are classified into:

- **Systematic Risk**: Risk applicable to the market as a whole, such as inflation, tax rises, interest rates, etc.
- **Specific Risk**: Residual risk unique to an individual firm or a small group of companies that form a subset of the market.

Hence, CAPM is the relationship between risk and return. Therefore, CAPM can highlight the relationship between the overall market scenario and its effect on an individual or group of companies.

Risk Free Return

The risk free rate of return is a benchmark figure against which all the investments in an economy should be measured. Reserve Bank of India provides information on Weighted Average Yield on Market Loans,

which is actually risk free return[13]. The value for the year 2007-08 was 8.12%[14] (the year of decision to go ahead with the project activity).

Market Return and risk premium

The market risk premium, as measured and applied in practice is the premium above the risk free rate is the return that investors expect to earn on a portfolio of equities. Equity indices are indicator of expected market return. With a view to eliminating the unsystematic risk associated with the projects totally, index containing 500 companies has been taken to represent the market return. A period starting since 1999 to 2008 has been considered to remove the impact of short term volatility. Selection of BSE 500 represent a more robust and efficient face of the market.

Beta

The project participant has estimated equity beta values for a number of power companies in India. Equity beta measures the risk that cannot be eliminated in a systematic, well balanced and diversified portfolio. The beta of equity is calculated as the covariance between its return and the return on a well diversified market portfolio, divided by the variance of the return on a well diversified market portfolio.

Equity Beta (β**e**) = Covariance (**r**, **rm**) / Variance (**rm**)

Where, **r** is the return from the equity investment in a single stock,

rm is the return from the equity investment in the well-diversified market portfolio.

However, the measured equity beta for a particular company relates to the unique capital structure of that firm and that a change in the capital structure will change the degree of financial risk borne by the equity holders and hence the equity beta. A common practice to allow equity betas to be compared across firms with different capital structures is to adjust the estimated equity beta into the equivalent asset beta (which is the equity beta that would apply if the assets were financed wholly with equity) using the following formula:

Asset beta = Equity beta / [1+ (1- Tax) x (debt / equity)]

Asset beta of some power companies in India

Company Name	Asset Beta (Unlevered)
NLC	1.19
CESC	0.97
GIPCL	0.94
TATA Power	0.87
Reliance Infra	0.71
NTPC	0.62
Beta (Average)	**0.88**

The cost of equity from the above values of Risk Free Return, Market Return and Equity Beta works out to be 21%. The debt interest rate for the project is 11%.

Thus based on the above and the following factors the Weighted Average Cost of Capital i.e., the benchmark of the project is determined at 11.41%.

Benchmark Estimation factors

Equity beta estimation	Value

[13] Page 340, Financial Management Theory, Concepts and Problems by R. P. Rustagi

[14] http://rbidocs.rbi.org.in/rdocs/AnnualReport/PDFs/86544.pdf

Debt	70%
Equity	30%
Debt interest rate	11%
WACC	**11.41%**

If the Project IRR of the project is less than this benchmark, then the project activity can be termed as financially unattractive and hence additional.
The Project IRR has been determined by taking into consideration the following assumptions:

Sl. No.	Parameter	Value Applied	References
1	Project capacity	10 MW	Page no 4, table point no 7 of the DPR
2	Capital cost (including excise duty, taxes and other expenditure)	INR 5,338.00 Lakhs	Detailed break up with references is given in next table
3	Debt : Equity (project DPR)	70:30	Page no 5 of the DPR
Sl. No.	**Parameter**	**Value Applied**	**References**
4	Interest on term loan (project DPR)	11%	Annexure 7 of project DPR
5	Repayment term	10 years	Annexure 7 of project DPR
6	Moratorium	2 years	Annexure 7 of project DPR
7	Repairs and maintenance expenses	1.5%	Page no 37, section 8.8 of project DPR
8	Escalation on O&M[15]	5%	
9	Income Tax	33.99%	IT Act (2006-07)
10	MAT	11.33%	IT Act (2006-07)
11	PLF	80% in first year, 85% in second year, 90% from third year	Page no 5, table point no. 19 of the DPR
12	Tariff	Rs.4.15/- with 3% escalation per annum	As per PPA signed between AA Energy limited and TPTCL

The breakup of the total project cost is as tabulated –

Cost of the project	Basic cost	Excise duty, CST/MST and other expenses on basic cost	Total Project cost	Reference

[15] Page no 5, Para 15, http://www.mercindia.org.in/pdf/Ord_2009_03_25_CNo_83_of_2008.pdf and Page no 55, Biomass Tariff Order by MERC, 08.08.2005

Land & site development	105.00	0.00	105.00	Annexture-1 of DPR Doc no GPD/DPR/07-08/034(F)
Factory shed & building & civil works	425.00	8.00	433.00	Annexture-2 of DPR Doc no GPD/DPR/07-08/034(F)
Plant & Machinery	3,700.00	721.00	4,421.00	Annexture-3 of DPR Doc no GPD/DPR/07-08/034(F)
Misc fixed assets	100.00	29.00	129.00	Annexture-4 of DPR Doc no GPD/DPR/07-08/034(F)
Preliminary & pre-operative expenses	150.00	0.00	150.00	Annexture-5 of DPR Doc no GPD/DPR/07-08/034(F)
Engineering consultancy	20.00	0.00	20.00	Schedule-A (Economics of the Project) of DPR Doc no GPD/DPR/07-08/034(F)
Contingencies	80.00	0.00	80.00	Page 34, section 7.6 of DPR Doc no GPD/DPR/07-08/034(F)
Total	**4,580.00**	**758.00**	**5,338.00**	

Estimation of rice husk price:-
The price of rice husk has been estimated based on information available at the decision making stage. The PP has used following information for estimation of rice husk price:-

1) Price of rice husk from biomass assessment report
2) Region wise surplus availability of rice husk
3) Estimation of rice husk consumption in proposed plant
4) Proposed date of commissioning of plant
5) Escalation on rice husk price from biomass assessment time to the proposed commissioning date

Based on the above mentioned information the PP has worked out the weighted average cost of rice husk and further PP has considered escalation on rice husk price. The explanation for the same has been provided below.

Explanation for weighted average cost of rice husk:-
Rice husk consumption on design basis in the power plant is 102,065 MT per annum. Rice husk available in region 1 (0-15 km) and region 2 (15-25 km) is only 70,656 MT and this will not meet the fuel demand of the power plant. Hence PP has to procure rice husk from a larger area covering 50 km of radius. This will increase the landed cost of fuel. Hence a weighted average landed cost of fuel has been worked out below.

Weighted average cost of rice husk
= (rice husk available in region 1 (MT) * price of rice husk applicable for region 1 (Rs/MT) + rice husk available in region 2 (MT) * price of rice husk applicable for region 2 (Rs/MT) + rice husk available in region 3 (MT) * price of rice husk applicable for region 3 (Rs/MT))/(sum of rice husk available in region 1, 2 and 3)

Weighted average cost of rice husk
= (56,832 * 1,550 +13,824 * 1,600 + 109,056 * 1,650)/ (56,832+13,824+109,056) ≈ 1,615 Rs/MT

Region	1 (0-15 km)	2 (15-25 km)	3 (25-50 km)
Surplus rice husk available as fuel (MTPA)	56,832	13,824	109,056

Price (Landed cost) (Rs/MT)	1,550	1,600	1,650
Weighted average cost (Rs/MT)	1,615		

Source:- Biomass assessment study report ,GPD/BAS/07-08/031(F)
Table 15 –Net surplus biomass available, section 4.2, page 24,
Table 19 - Estimation of biomass landed price, section 5.2, page 30

Explanation for escalation in price of biomass:-
The biomass assessment was carried out in December 2007 and the report was prepared in March 2008[16]. As per the project schedule provided in the DPR[17], the commissioning and synchronization of plant would take 15 months from ordering of boiler and turbo-generator. As per the chronology of events it is clear that PO for boiler and turbo-generator were placed in August 2008 (20/08/2008) and September 2008 (20/09/2008) respectively. Hence during the decision making stage it was known to PP that plant would be commissioned only after November 2009 (considering 15 months after the PO date of turbo-generator). Based on this the PP has considered escalation of 5% per year[18] on compounded basis on fuel price for two years (December 2007 to December 2009) and PP had estimated the rice husk price as 1780 Rs/MT (based on 5% escalation for 2 years on 1,615 Rs/MT). Please also note that the synchronization of plant happened only on 30/04/2010[19] which is after 19 months of PO date of turbo-generator and 28 months after the biomass assessment (December 2007). Hence it can be concluded that the escalation of 5% on rice husk price for 2 years is conservative.

Historical trend of biomass price:-
As per Maharashtra tariff order dated 08/08/2005, section 5.6, page 55, MBEDA's submission and most of the DPRs have considered fuel price escalation factor of 5% per annum on compounded basis. The same has been accepted by the commission. This clearly shows that a minimum escalation of 5% on biomass price on compounded basis was quite possible after 2005. PP has also requested the biomass surveying agency MITCON to provide the historical trend (after 2005) for rice husk price in Gadchiroli or nearby region to substantiate it further. Following trend on rice husk price has been provided by MITCON:-

Sl. No.	Year	Average price (Rs/ MT)
1	2005	900
2	2006	1,200
3	2007	1,500
4	2008	1,800
5	2009	2,000

The given trend shows that the rate of escalation of rice husk price is more than 17% for last 5 years. However the PP has taken an escalation of 5% which is conservative.

Detailed financial computations have been carried out using the aforementioned parameters to assess the viability of the proposed project activity; the results of the same are as follows –

[16] Biomass assessment study report ,GPD/BAS/07-08/031(F)
[17] Page no 51, Project schedule given in DPR, GPD/DPR/07-08/034(F)
[18] Page 55, Biomass Tariff Order by MERC, 08.08.2005 and page 4 of DPR, GPD/DPR/07-08/034(F)
[19] Minutes of meeting with Maharashtra state electricity transmission company limited for synchronization of 10 MW plant with 132 KV substation

Parameter[20]	Without CDM revenues	With CDM revenues
Project IRR	8.31%	13.86%

This clearly indicates that the benchmark of 11.41% is not achieved on a stand-alone basis for this project activity and hence it is essential to consider the revenues from CDM to make this a financially viable project. Further a sensitivity analysis has been carried out subjecting critical parameters to ± 10% variation the results of the same are as below –

Parameter	Project IRR %
Project cost – 10%	9.98%
Tariff + 10 %	9.93%

Explanation for not doing sensitivity analysis on biomass price
During the decision making stage, PP had requested rice husk suppliers in nearby region (within 50 km) to provide quotations for rice husk and from quotations it is evident that the price of rice husk is higher than 1,800 Rs/MT[21].

As per petition filed by MEDA dated 25/03/2009, the price of rice husk is given as 1,800 Rs/MT to 1,820 Rs/MT.
PP had also requested biomass assessment agency (MITCON) to provide the historical trend of rice husk price for Gadchiroli or nearby region. The trend provided by MITCON shows that the rate of escalation on rice husk price is more than 17% per annum. However PP has considered rate of escalation of 5% on rice husk price.

Looking at the 5% escalation on fuel cost and all the above mentioned documents it is clear that the rice husk price considered is itself on lower side and a further fall by 10% is highly improbable.
This can be further substantiated with the actual fuel bills[22] and payment made by client against the same.

A sensitivity analysis on PLF variation has not been carried out, as the PLF considered for this project from its year 3 of operation is 90%, assuming a +10% variation implies the plant is running on 100% PLF which is not a likely scenario. The sensitivity analysis has been carried out subjecting Biomass price, tariff and project cost to ± 10% variation (wherever applicable). Biomass price considered is itself on a lower side. A further fall by 10% is highly impractical. Any upward change in biomass price or increase in project cost or downward change in power tariff would have negative impact on project IRR hence these are excluded from the analysis.
The results of the sensitivity analysis clearly reveal that even on a best case scenario, the project is not viable on a stand-alone basis. Hence the revenue from CDM would be an impetus to the project activity.

Hence it is proved that the project activity faces barriers to implementation financially, thus income from CDM would certainly be a driving force for sustained operation of the project activity.

[20] Refer project cash flow statement
[21] Copy of quotations received from rice husk suppliers
[22] Log book copy, rice husk bills from supplier and bank statement showing the payment details have been provided to validator

B.6. Emission reductions
B.6.1. Explanation of methodological choices
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This project activity has adopted AMS I.D/ Version 15 (October 30, 2009) for the emission reduction calculations.

Baseline
The baseline emissions are the product of electrical energy baseline EG_y expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.
Baseline emission factor is calculated as combined margin, consisting of a combination of operating margin (OM) and build margin (BM) factors.

$BE_y = EG_y * EF_{CO2}$

Where,
BE_y is the baseline emissions due to displacement of electricity during the year y (tonnes of CO_2)
EG_y is the unit of electricity exported to the grid due to this project activity in year y (MWh)
EF_{CO2} is the emission factor of the grid in year y (tCO_2/MWh).

As per para 20 of the applicable methodology if fossil fuel is used the electricity generation metered should be adjusted by deducting the electricity generation from fossil fuels using the specific fuel consumption and the quantity of fossil fuel consumed as per below formula:

Gross electricity adjusted using Coal, $EG_{y,FF}$ = (Gross electricity generation - $FC_{i,j,y}$ / SFC_{FF})

Where:
$FC_{i,j,y}$ = Quantity of fuel type i combusted in process j during the year y (Tonne/year)
SFC_{FF} = Specific fuel consumption of fossil fuel (Tonne/MWh)

As per para 22 of the applicable methodology amount of electricity generated using biomass fuels is calculated through below formula:

Gross electricity generation using rice husk, $EG_{y,ricehusk}$ = $Q_{biomass,y}$ / $SFC_{ricehusk}$
Where:
$Q_{biomass,y}$ = Quantity of biomass (rice husk) used for power generation process in year (Tonne/year)
$SFC_{ricehusk}$ = Specific fuel consumption ricehusk (Tonne/MWh)

The amount of electricity generated using biomass fuels calculated as per para 20 of the applicable methodology shall be compared with the amount of electricity generated calculated using specific fuel consumption and amount of each type of biomass fuel used. The lower of the two values should be used to calculate emission reductions. This is in line with the para 22 of the methodology AMS I.D. version 15.

Net electricity exported to grid due to the project activity in year y**, EG_y = Min ($EG_{y,ricehusk}$, $EG_{y,FF}$)**

The monitoring methodology lists the parameters that need to be monitored for estimating the baseline and project emissions as well as leakage.

Project emissions

The PP has ruled out the possibility of using fossil fuels for co-firing, hence the project activity emissions are not applicable under the current scenario. However, small quantity of fossil fuel may be used for start up the boiler and as co-firing in the project activity. PP has installed F.O. based DG set to meet power demand during start-up of the plant. Project emissions on account of use of fossil fuel would be considered and monitored as per the "**Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", version-02, EB41**[23].

Project Emissions due to Auxiliary Fuel (e.g. Coal, F.O. etc) Consumption is estimated as per the following equation:

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

Where

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

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

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

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

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using Option B (Option A is not followed as the chemical composition of fossil fuel type i is not available with PP) as follows:

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

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

Where:

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

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

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

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

[23] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Leakage emissions (LE_y)

A. **As per the "General guidance on leakage in biomass project activities, Version 03"** leakage estimation has been done as below:

The project activity proposes using surplus biomass (rice husk) available surplus in the region. The guidance has highlighted three distinct possibilities of leakage in biomass usage.

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

*Applicable to the project activity.

In line with the latest guidance on leakage in biomass project activities "Attachment C to Appendix B version03" it has been demonstrated through biomass assessment report that the biomass available in the region is 161,741 MT which is in excess of 59,676 MT i.e. 58.47% as larger than the quantity of biomass that will be utilized including the project activity[24]. It is demonstrated that during PDD preparation the amount of surplus biomass material is more than the minimum stipulation of 25% in the region. Leakage associated with competing use of biomass material is thus neglected in the project.

B. Leakage due to transfer of equipments to/ from the project activity

The project activity does not give rise to leakage emissions because the energy generating equipment is not transferred from another activity and the existing equipment will not be transferred to another activity.

[24] Source: "Biomass assessment report" prepared for the project by Mitcon

C. Leakage due to transportation of biomass to the plant site

As per paragraph 38 of AMS.I.C version 17*"In case collection/processing/transportation of biomass residues is outside the project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the project site should be considered".* AA Energy purchase rice husk from outside of the project boundary. So, the leakage applicable for this project activity will be due to transportation of biomass residues to project site. Now as per EB 51 paragraph 46 (d) "If biomass residues are transported over a distance of more than 200 kilometers due to the implementation of the project activity then this leakage source attributed to transportation shall be considered, otherwise it can be neglected." For ex ante estimation, leakage emission would be considered zero, based on the biomass surplus availability report, which proves biomass is available in plenty within a distance of 50 Km radius around the project site. However, for ex post calculation, emission due to biomass transportation would be monitored and neglected, only if the average distance for biomass transportation is lower than 200 Km. If the average distance for biomass transportation is calculated to be more than 200 km, leakage emission due to .biomass transportation would be estimated using equation given below:

$$LE_{transport} = N_{truck,y} * AVD_{max,y} * 2 * SP_{con,HSD} * Density_{HSD} * NCV_{HSD} * EF_{HSD}$$

Where

$LE_{transport}$	Leakage emission due to transportation in year y (tCO_2/year)
$N_{truck,y}$	Number of truck trips from the biomass source to the power plant in year y
$AVD_{max,y}$	Max distance of the Power plant from the Rice husk source in year y (km)
$SP_{con,HSD}$	Default fuel economy for light duty diesel truck as per IPCC data (liter/km) (5.7 km/liter)[25]
$Density_{HSD}$	Default value for density of diesel (kg/liter) (0.82 kg/liter)[26]
NCV_{HSD}	Default value for net calorific value of diesel as per IPCC 2006 (TJ/kg) (43 TJ/Gg)
EF_{HSD}	Default value for emission factor of diesel as per IPCC 2006 (tCO_2/TJ) (74.1 tCO_2/TJ)

The biomass assessment study carried out for the project activity reveals that:

- The rice husk used for the project activity is available within 50 km radial distance from the project site and the rice husk is transported within a distance of 50 km from the project site. Rice husk doesn't require any processing which results in significant emission.
- The quantity of biomass available in the region is more than 25% of the biomass utilized in the project activity.

Hence leakage has been neglected.

$LE_y = 0$;

Emission Reductions

The total emissions reduction from the project activity is thus calculated as –

$$ER_y = BE_y – PE_y – LE_y$$

Where,

ER_y is the total emissions reductions achieved in the year y (tonnes of CO_2)

[25] www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ref4.pdf
[26] http://www.siamindia.com/scripts/diesel.aspx

B.6.2. Data and parameters fixed ex ante

Data / Parameter	EF_{CO2}
Unit	tCO_2/MWh
Description	Fixed ex-ante combined margin emission factor of NEWNE grid derived from the OM and BM values
Source of data	CO_2 Baseline Database Version 4.0 dated October 2008 published by CEA
Value(s) applied	0.805
Choice of data or Measurement methods and procedures	The fixed ex-ante combined margin emission factor is used in the calculation of emission reductions.
Purpose of data	Baseline emission calculation
Additional comment	The latest available EF_{CO2} value at the time of submission of project to UNFCCC will be used. The CM value is the weighted average of the last three year's OM value and last year's BM value, with 50% weightage given to both OM & BM calculated in a transparent and conservative manner by the CEA.

Data / Parameter	$SFC_{rice\ husk}$		
Unit	Tonne of rice husk/MWh		
Description	Specific fuel consumption of rice husk		
Source of data	Calculated based on NCV of rice husk and design data of the boiler and turbine		
Value(s) applied	1.1089		
Choice of data or Measurement methods and procedures	The calculation is based on specific fuel consumption in boiler for steam generation and specific steam consumption in turbine for electricity generation.		
	Parameter	**Value**	**Unit**
	Specific fuel consumption in boiler	0.27	Tonne of Rice husk/Tonne of steam
	Specific steam consumption	4.07	Tonne of steam/MWh
	Specific fuel consumption of power plant	1.1089	Tonne of Rice husk/MWh
	The detailed calculation is provided in the calculation sheet[27].		
Purpose of data	Baseline emission calculation		
Additional comment	Specific fuel consumption has been specified ex ante based on designed data and this will be ex ante fixed for the crediting period.		

[27] Calculation sheet for SFC calculation has been provided to DOE for validation.

Data / Parameter	SFC_{FF}
Unit	Tonnes of fossil fuel/MWh
Description	Specific fuel consumption of fossil fuel
Source of data	Calculated based on NCV of coal and design data of the boiler and turbine
Value(s) applied	0.839
Choice of data or Measurement methods and procedures	The calculation is based on specific fuel consumption in boiler for steam generation and specific steam consumption in turbine for electricity generation. **Parameter** / **Value** / **Unit** Specific fuel consumption in boiler / 0.21 / Tonne of Coal/Tonne of steam Specific steam consumption / 4.07 / Tonne of steam/MWh Specific fuel consumption of power plant / 0.839 / Tonne of coal/MWh The detailed calculation is provided in the calculation sheet[28].
Purpose of data	Calculation of Baseline emissions
Additional comment	Specific fuel consumption has been specified ex ante based on designed data and this will be ex ante fixed for the crediting period.

B.6.3. Ex-ante calculation of emission reductions

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Baseline

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

$EG_{BL,y}$ = 55,884 MWh
EF_{CO2} = 0.805 tCO_2/MWh
BE_y = 44,986 tCO_2

Project emissions:

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

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

Where

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

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

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

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

[28] Calculation sheet for SFC calculation has been provided to DOE for validation.

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

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

$PE_y = 0$

Leakage emissions

No leakage emissions occur due to this project activity.

$LE_y = 0$

Emission reductions

$ER_y = BE_y – PE_y - LE_y$ or $ER_y = BE_y – PE_y$ as $LE_y = 0$

$ER_y = 44{,}986\ tCO_2$ (in Year 1)

B.6.4. Summary of ex-ante estimates of emission reductions

Year	Baseline emissions (tCO_2 e)	Project emissions (tCO_2 e)	Leakage (tCO_2 e)	Emission reductions (tCO_2 e)
2011 – 2012	44,986	0	0	44,986
2012 – 2013	47,798	0	0	47,798
2013 – 2014	50,610	0	0	50,610
2014 – 2015	50,610	0	0	50,610
2015– 2016	50,610	0	0	50,610
2016 – 2017	50,610	0	0	50,610
2017 – 2018	50,610	0	0	50,610
2018 – 2019	50,610	0	0	50,610
2019 – 2020	50,610	0	0	50,610
2020 – 2021	50,610	0	0	50,610
Total	**497,660**	**0**	**0**	**497,660**
Total number of crediting years	**10**			
Annual average over the crediting period	**49,766**	**0**	**0**	**49,766**

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

Data / Parameter	**$EG_{BL, y}$**
Unit	MWh
Description	Net electricity exported to the grid from this project activity
Source of data	Monthly energy meter reading records issued by the TPTCL / sales invoice raised by AAEL
Value(s) applied	55,884
Measurement methods and procedures	Measured monthly using the calibrated energy meters in the presence of AAEL site in charge and TPTCL representative.
Monitoring frequency	Measuring: Continuously Reading: Hourly Recording: Monthly
QA/QC procedures	The energy meters used will be calibrated annually by external agencies approved by government. Measurement results shall be cross-checked with records for sold electricity.
Purpose of data	Calculation of baseline emissions
Additional comment	Two-way metering system will be implemented comprising of a main and a check meter. In case of discrepancies the least of the two meter reading values will be considered for conservativeness. Net electricity supplied by the project activity to the grid would be used for CER calculation. The amount of electricity generated from plant shall be compared with the amount of electricity generated calculated using specific fuel consumption and amount of biomass fuel used. The lower of the two values should be used to calculate emission reductions.

Data / Parameter	$Q_{biomass,y}$
Unit	Tonnes/annum
Description	Quantity of biomass (rice husk) used for power generation process in year y
Source of data	On-site measurement.
Value(s) applied	102,065
Measurement methods and procedures	The quantity of biomass (rice husk) is weighed on the weighbridge and actual quantity of biomass used in boiler measured through load cell on the conveyor..Out of these two values conservative value will be used for emission reduction calculation.
Monitoring frequency	Measuring: Continuously Reading: Daily Recording: Daily
QA/QC procedures	Weighbridge and load cell will be calibrated annually by external agencies approved by government.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$FC_{i,j,y}$
Unit	Tonnes/annum or volume/annum
Description	Quantity of fuel type i combusted in process j during the year y
Source of data	On site measurement
Value(s) applied	Based on measured value
Measurement methods and procedures	The quantity of fossil fuel (solid) weighed in the weighbridge. The quantity of fossil fuel (liquid) will be measured by volume meters. This data will be recorded in log-book and this will be crossed checked with fuel bills.
Monitoring frequency	Measuring: Continuously Reading: Daily Recording: Daily
QA/QC procedures	Weighbridge and volume meter will be calibrated annually by external agencies approved by government.
Purpose of data	Calculation of baseline emissions
Additional comment	Coal shall be used during contingency and such usage of coal during contingency would be recorded.

Data / Parameter	$NCV_{i,y}$
Unit	TJ/tone or TJ/volume
Description	Net calorific value of fossil fuel of type in year y
Source of data	The following data sources may be used if the relevant conditions apply: a) Values provided by the fuel supplier in invoices b) Measurements by the project participants (If a) is not available)
Value(s) applied	Based on source of data
Measurement methods and procedures	For a) and b): Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency	Measuring: For a) and b): The NCV should be obtained for each fuel delivery Recording: Monthly
QA/QC procedures	Verify if the values under NCVs are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a) or b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Purpose of data	Calculation of Project emissions
Additional comment	-

Data / Parameter	$N_{truck,y}$
Unit	-
Description	Number of truck/vehicle trips from the biomass source to the power plant in year y
Source of data	On site measurement
Value(s) applied	Based on measured value
Measurement methods and procedures	The no. of deliveries/vehicles will be recorded in log book at the factory gate.
Monitoring frequency	Monthly
QA/QC procedures	This can be cross-checked with average carrying capacity of vehicle and quantity of rice husk consumed in that period.
Purpose of data	Calculation of leakage
Additional comment	-

Data / Parameter	**$AVD_{max,y}$**
Unit	km
Description	Max distance of the Power plant from the Rice husk source in year y
Source of data	Plant Records
Value(s) applied	Based on measured value
Measurement methods and procedures	The distance between plant site and supplier will be recorded in log book at the factory gate for each delivery
Monitoring frequency	Each delivery
QA/QC procedures	No QA/QC is required as the maximum distance will be considered for calculation of leakage due to transportation.
Purpose of data	Calculation of leakage.
Additional comment	Leakage due to transportation will be neglected if the distance between rice husk supplier and plant site is less than 200 km.

B.7.2. Sampling plan

>>

Monitored parameter in section B.7.1 above is not determined by any sampling approach. Hence, there is no specific sampling plan involved in the project activity.

B.7.3. Other elements of monitoring plan

>>

AAEL proposes the following structure for data monitoring, collection, data archiving and calibration of equipments for this project activity. The detailed manpower chart as per the DPR is provided in Annex 4.

The General Manager overseas the overall functioning and maintenance of the project activity, the dedicated team formed under his supervision will work on specified tasks.

At the project site the in-charge maintains the data records, ensures completeness of data, and reliability of data (calibration of equipments). Wherein even day to day data of electricity generation is collected and maintained through a log book for data to be monitored. These reports are checked periodically by the Chief Engineer and discussed thoroughly with the data monitoring personnel. A separate log will also be maintained for the biomass supply on the site, its storage and usage in the project activity. Similarly the usage of coal during contingency would be recorded along with biomass usage data. To ensure reliability of the measuring equipments via energy meter (used to measure net saleable power), weighbridge; will be calibrated annually by external agencies approved by government and maintained as per industry standards. Documents pertaining to annual testing of equipments (energy meter, weighbridge) shall be maintained at the plant site.

All data collected as part of monitoring should be archived in paper and will be kept at least for 2 years after the end of the crediting period.

The Chief Engineer ensures the proper functioning of all the equipments/ instruments and shall take a corrective action if found not operating as and when required. Further the project activity will not result in any unidentified activity that can result in substantial emissions from the project activity.

Emission reduction calculations and monitoring report will be done annually based on the data collected. The monitoring report and the emission reduction calculation will be maintained at the plant site/head office for annual verification purposes.

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity
>>
20/08/2008 (Boiler purchase agreement date)

C.1.2. Expected operational lifetime of project activity
>>
20 years and 0 month

C.2. Crediting period of project activity
C.2.1. Type of crediting period
>>
10 year fixed crediting period

C.2.2. Start date of crediting period
>>
04/01/2011 or the date of registration of the project activity with CDM – EB of UNFCCC , whichever occurs later.

C.2.3. Length of crediting period
>>
10 years and 0 month

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts
>>
As per the notification from MoEF dated September 14, 2006[29], the list of project activities which require prior environmental clearance is stipulated. This does not include the proposed small scale project activity type as it involves power generation using renewable biomass.

However prior to implementation PP has notified Maharashtra state pollution control board (MSPCB) for necessary evaluation and approval, based on which MSPCB have issued a No Objection Certificate (NOC) vide Consent No. BO/RO (P&P)/CC-308 dated 24/06/2008.

The Maharashtra Government has also issued Environment Clearance for this project vide No. Powar – 2008/356/CR/TC – 1 dated 22/01/2009.

Environmental impacts from this proposed small scale project are not considered significant.

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

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

The PP applied to the office of the Municipal Council in Desaignaj Wadsa seeking "No Objection" to set up the proposed biomass based power generation project. In response to this the Municipal Council had published a proclamation (public notice) on 02/02/2008 for the information of general public in the region. It was also clearly stated that "if anybody has any objection to the above plant should present their objections to Municipal Council Office within 15 days".

E.2. Summary of comments received

>>

The citizens who had objections had presented them to Municipal Council with their stamp signature on 14/02/2008. Those citizens who had raised objections were invited to the Municipal Council Hall where the PP's representative was also present who had explained to the gathering about the credentials of the project.

After all "for and against" discussion it was unanimously decided that in view of town development, to give stimulus to the industries in Desaiganj Municipal Council and to make available employment to local unemployed youth on priority basis "No Objection Certificate" was issued by the Municipal Council and a Resolution (No.205) was passed on the same day.

E.3. Report on consideration of comments received

>>

The PP was requested to give priority for employing local unemployed youth in the proposed activity. Which was readily accepted by the PP as it is also feasible to the PP to employ suitably qualified manpower from the local rather than hiring from the neighbouring districts/States.

The people were in favour of this project which is understandable from the fact that unanimous decision was achieved in the public hearing process conducted by Municipal Council, Desaiganj Wadsa for and on behalf of this project.

SECTION F. Approval and authorization

>>

The approval letter from the host country is available at the time of submission of PDD to the validating DOE.

UNFCCC webpage of this project: http://cdm.unfccc.int/Projects/DB/SGS-UKL1288172340.56/view

Appendix 1: Contact information of project participants

Organization	A.A. Energy Limited
Street/P.O. Box	No.101
Building	Nikalas Tower, Central Bazaar Road, Ramdaspeth,
City	Nagpur,
State/Region	Maharashtra
Postcode	440 010
Country	India
Telephone	+91-712-6638432
Fax	+91-712-2420688
E-mail	aaenergyltd@yahoo.com
Website	
Contact person	Mr. Swapnil Agrawal
Title	Director
Salutation	Mr.
Last name	Agrawal
Middle name	
First name	Swapnil
Department	
Mobile	+919822571145
Direct fax	+91-712-2420688
Direct tel.	+91-712-6638432
Personal e-mail	swapnilagrawal@rediffmail.com

Appendix 2: Affirmation regarding public funding

There is no public funding involved in this project activity.

Appendix 3: Applicability of selected methodology

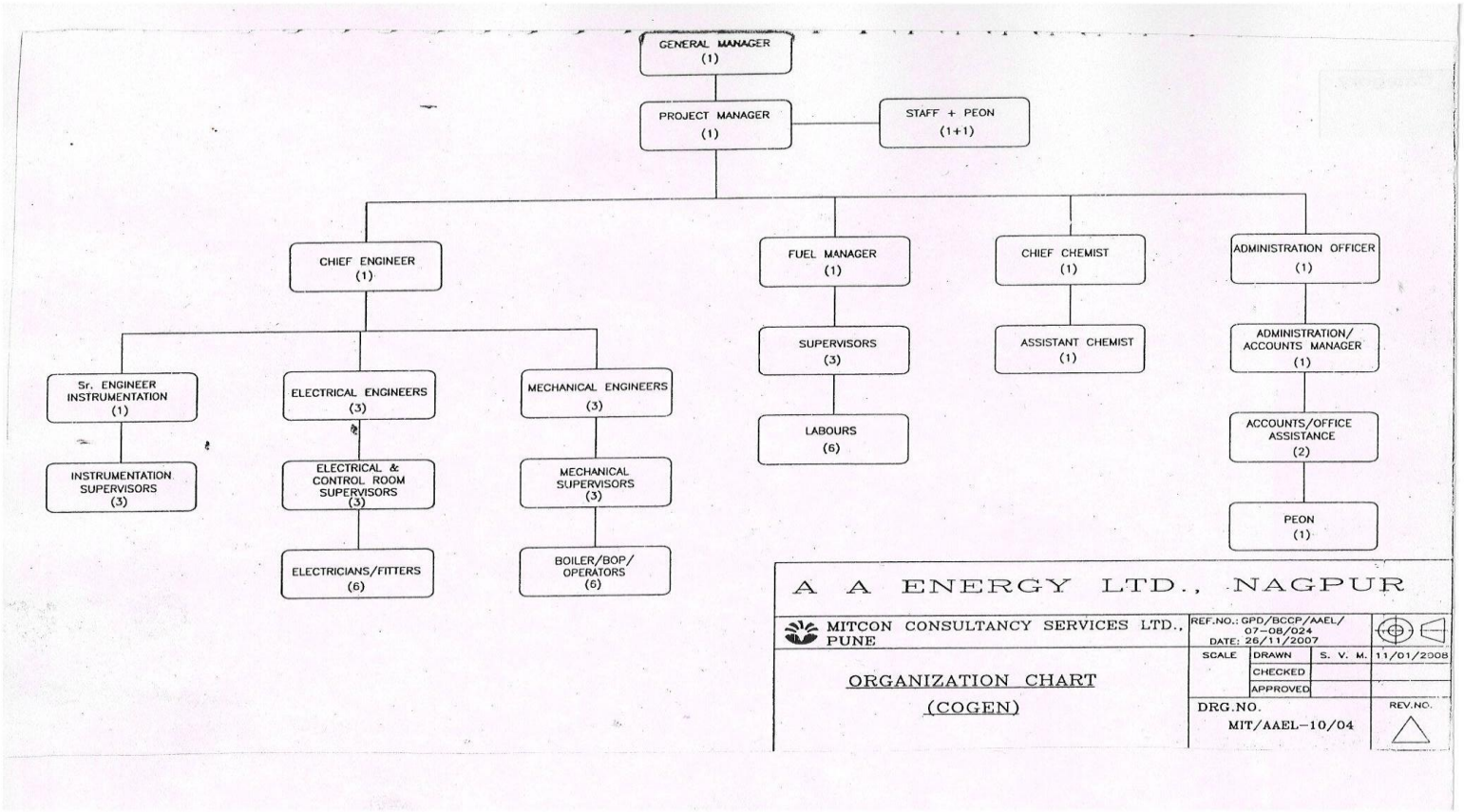
Detailed applicability condition for the selected methodology is provided in section B.2.

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

Ex-ante calculation of emission reduction is provided in section B.6.3.

Appendix 5: Further background information on monitoring plan

The detailed monitoring plan is as provided in section B.7.3, the monitoring team structure is as provided –



Appendix 6: Summary of post registration changes

Following post registration changes are done during the current crediting period:

Relevant section of PDD	Information in original PDD	Post registration changes
B.6.1	Baseline emissions calculation procedure described in the section didn't include the explicit calculation procedure for cases where coal is being used in the project activity.	The section is now elaborated and made in line with the requirements of para 20 and 22 of the applicable methodology AMS I.D. Version 15. The para 20 & 22 of the applicable methodology guide on the baseline calculation procedure in case of usage of fossil fuel.
B.6.2	SFC_{FF} was not included as an ex-ante parameter.	Now SFC_{FF} is included as ex-ante parameter
B.7.1	For some of the monitoring parameters, the description against the rows "Monitoring frequency" and "Description" was not clearly mentioned.	The description was now elaborated or rephrased against the rows "Monitoring frequency" and "Description"
Corrections and Editorial changes throughout the PDD		Corrections and Editorial changes have been made to the information in the registered PDD such as format used for presentation of values, Font type and size, revision of non working weblinks, correctly mention the methodology as I.D instead of 1.D, consistent use of parameter notation $EG_{BL,y}$, etc

Appendix 7: BASELINE INFORMATION

This project uses fixed ex-ante combined margin emission factor calculations for NEWNE grid published by the CEA of India, following the approaches and rules defined in Tool to calculate emission factor for an electricity system (Version 01) EB 35, Annex 12. For details please refer –

http://www.cea.nic.in/reports/planning/cdm_co2/database_publishing_ver4.zip

1. Baseline Carbon Dioxide Emission Database Version 4.0 – **LATEST**
2. User Guide – Version 4.0 - **LATEST**

This corresponds to the baseline database as on October 2008, Version 4.0.

Appendix 8:

4. LIKELY CAPACITY ADDITION DURING 11TH PLAN
FOR THE STATE : - MAHARASTRA

Project Name	Type	Status	Installed Capacity (MW)	Capacity Addition During XIth Plan (MW)	Benefits Shares of state (MW)	Commissioned/ slipped during 2007-2012 (MW)		Last Unit Commissioning Date/ (Likely Date of Commissioning)
CENTRAL-SECTOR								
SIPAT STPS II	T	U	1000.00	1000.00	257.93	COMM	500.00	27.05.2007
SIPAT I	T	U	1980.00	1980.00	510.69			(2009-2011)
DABHOL RATNAGIR	G	U	740.00	740.00	740.00	COMM	740.00	28.10.2007
*KORBA ST.-III	T	U	500.00	500.00	128.96			(2010-2011)
KAHALGAON 6,7	T	U	1000.00	1000.00	98.56	COMM	500.00	16.03.2008
*BARH ST-I	T	U	1980.00	1320.00	100.00			(2011-2012)
*SUBANSIRI LOWE	H	U	2000.00	2000.00	151.32			(2011-2012)
CENTRAL-SECTOR TOTAL:-					1987.46			
STATE-SECTOR								
GHATGHAR PSS	H	U	250.00	250.00	250.00	COMM	250.00	01.07.2008
KHAPERKHEDA EX	T	U	500.00	500.00	500.00			(2010-2011)
BHUSAWAL	T	U	1000.00	1000.00	1000.00			(2010-2011)
PARLI EXT U-2	T	U	250.00	250.00	250.00			(2009-2010)
PARAS EXT U-1&2	T	U	500.00	500.00	500.00	COMM	250.00	31.05.2007
STATE - SECTOR TOTAL:-					2500.00			
PRIVATE-SECTOR								
TROMBAY EXTN.	T	U	250.00	250.00	250.00			(2008-2009)
RATNAGIRI JSW	T	U	1200.00	1200.00	1200.00			(2010-2012)
PRIVATE-SECTOR TOTAL:-					1450.00			
GRAND-TOTAL:-					5937.46			

NOTE :- U - UNDER CONSTRUCTION PROJECTS
C - CONSTRUCTION YET TO START (LOA TO BE PLACED)
* SHARES FROM CENTRAL SECTOR PROJECTS FOR WHICH M.O.P. ORDERS ARE YET TO BE ISSUED ARE TENTATIVE

History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities" (EB 66, Annex 9).
03	EB 28, Annex 34 15 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.
02	EB 20, Annex 14 08 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>.
01	EB 07, Annex 05 21 January 2003	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		