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:

6 MW Biomass residue based cogeneration unit by MPML at Village Heti (Surla), District Nagpur in Maharashtra, India
Version 1.0
31/01/07

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

The purpose of project activity is to utilise available renewable biomass in the region to generate steam and electricity at an upcoming plant for making news print paper. Malu Paper Mills Limited (MPML) is a public limited company. The power shortage situation in the region has been the driving force for management to consider captive power unit and achieve self reliance for energy needs.

The MPML is setting up a new paper plant with capacity of 150 TPD, which shall enhance the total capacity of newsprint & Kraft paper making to about 235 TPD.

MPML decided to set up a captive cogeneration unit to meet in-house power demands. The proponent is actively involved in coal and lignite trading, so procurement of coal would have been business as usual scenario. But taking a lead in the region, MPML decided to set up co generation unit with a multi fuel boiler to facilitate usage of rice husk as a primary fuel. Due to various constraints involved in rice husk based power generation facility, MPML decided to take up project activity after considering carbon credit benefits extended for green energy projects through CDM by UNFCCC. The co-generation unit is expected to be commissioned by May'2007 and subsequently the paper mill shall be commissioned by July'2007.

The project comprises of high pressure boiler and a turbine and generator arrangement with maximum output capacity of 6.0MW. The project activity shall consist of rice husk usage as a primary fuel, and some amounts of coal during start ups. The coal usage shall be to the least possible quantities and well accounted for. The coal usage shall be continuously monitored and considered as project emissions.

Contribution of Project to Sustainable Development

MPML at its existing facility is using coal to meet the steam requirements. Using biomass to produce steam and electricity in new cogeneration facility will reduce dependence on conventional fuels and increase energy security of region as well as nation. The independence from grid increases power availability in region. Being a renewable energy project, the project has good sustainable development indicators associated to it.

Social Well Being

India faces a peak power shortage of 11.70%[1]. Wind energy projects will not only contribute in closing this deficit but they also contribute toward government of India's plan of meeting 10% of the total power requirement in the country from renewable sources of energy. Maharashtra state itself is suffering from power shortage resulting in load shedding and power cuts over recent times. The project proponents may consider the plan to develop barren lands for dedicated biomass procurement.

Economic well being:
The project implementation has provided a fillip to economic activity in the region. Direct & indirect employment shall be generated in the plant for the project implementation & management. The biomass procurement will provide opportunity to local people to earn from agricultural wastes. The success of this project will encourage more business houses to invest in

Environmental well being:
The renewable energy projects reduce dependence and usage of fossil fuels which other wise would have led to GHG emissions to the atmosphere. The conservation of natural resources like coal etc. further boosts the energy security of region and country.

Technological well being:
The technology used in the power plant is proven and safe. Increased interest in renewable energy projects will further push R&D efforts by technology providers to develop more efficient and better equipments in future.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host involved)	Private and/or public entity(ies) Project Participants(*) (as applicable)	Party involved wishes to be considered as project participant (Yes/No)
India (host)	Malu Paper Mills Limited	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.:

Maharashtra

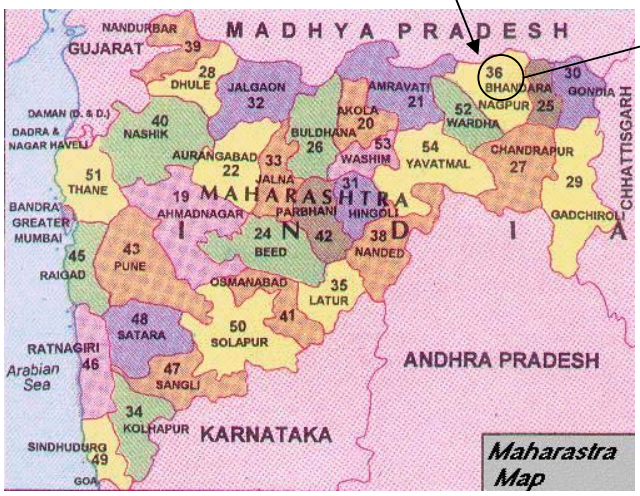
[1] Ministry of Power data for 2004-05, Annual report (page-141)

A.4.1.3. City/Town/Community etc:

Village: Heti (Surla),
District : Nagpur

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 in the paper manufacturing facility of MPML unit-III on Nagpur – Bhopal highway. The site is about 40 km from city of Nagpur and about 5 km from MPML premises where Unit – I&II is located. The following map gives an idea about geographical location of project activity.



Project site

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

Main Category:
Type I – Renewable Energy Projects

Sub Category:
I C – Thermal energy for user.

This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Examples include solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass for water heating, space heating, or drying, and other technologies that provide thermal energy that displaces fossil fuel. Biomass-based co-generating systems that produce heat and electricity for use on-site are included in this category.

Technology of Project Activity:

The following systems are part of project boundary and constitute rice husk based cogeneration facility.

- **Fuel Handling Plant:** This is supplied by M/s. Saikrupa Industries, Pune. This consists of impact crusher to handle coal as well as rice husk. It consists of two conveyer belts one for feeding raw coal to impact crusher and other for crushed coal or rice husk.
- **35 TPH FBC Boiler:** Supplied by M/s. Cethar Vessels (P) Ltd., Mumbai. The boilers system is a single drum water tube boiler and a pneumatic under-bed fuel feeding system. Design specifications are.

Steam Pressure	66 bar
Steam flow	35 TPH
Steam temp.	485 ± 5°C
Feed water temp.	105 °C
Design Code	1 BR 1950 with latest amendments

- **Steam Turbine:** Supplied by M/s. Triveni Engineering & Industries Ltd., Pune. This is a multistage, nozzle governed, horizontal spindle, impulse type, and bleed cum condensing system. The turbine has a power rating of 6000KW, speed rating of 7500 rpm and weighs about 75 tonnes.
- **Alternator – AC generator:** Supplied by M/s. Triveni Engineering & Industries Ltd., Bangalore (TPDS). It is a Simplex, modular and free standing system, with rated voltage of 11.0kv ± 10%. The current rating of system is 45 g. Amps and frequency rating is 50 Hz ± 5 %.
- **Water treatment plant:** Water treatment plant for the requirement of DM water is supplied by Ion-Exchange (I) Ltd. The process parameters of the system are constituted by:

    a. Chlorination
    b. Coagulation
    c. Pressure Sand Filters

d. Activated Carbon filters
e. De-chlorination dosing system
f. Antiscalant dosing system.
g. Reverse Osmosis module
h. Strong acid cation exchanger.
i. Strong base anion exchanger
j. Mixed bed-unit
k. Ph correction dosing system.

- **ESP unit:** It has a capacity of 150 Mgms/Nm3 of dust burden at inlet of ESP. The M.S. chimney is supplied by Shell tech. Engineering Company, Nagpur.

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

Year	Annual Estimation of emission reduction in tonnes of CO2e
2007-08	74232
2008-09	74232
2009-10	74232
2011-12	74232
2012-13	74232
2013-14	74232
2014-15	74232
2015-16	74232
2016-17	74232
2017-18	74232
Total estimated reductions (tonnes of CO2e)	742320
Total number of crediting years	10 years (fixed crediting period)
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	74232

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

No public funding as part of project financing from parties included in Annex I of the convention is involved in 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 appendix–C of the indicative simplified modalities and procedure for small scale CDM project activity. A project activity is considered to be a de-bundled component of large project activity if there is registered small scale CDM project or request for registration by another small scale project activity by the same project participants; In the same project category and technology/measure; and Registered

within the previous 2 years; and whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The project activity undertaken by MPML is first of its kind being under taken by project proponents, so it is clearly not a de-bundled component of a large scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Methodology*:* AMS I.C. 'Thermal energy for user', Version 09, 23 December 2006/Scope 1

Reference: Appendix B of the simplified modalities & procedures for small-scale CDM-project activities

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

The methodology states eligibility criteria for choice of project activity as follows:

- This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Examples include solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass for water heating, space heating, or drying, and other technologies that provide thermal energy that displaces fossil fuel. Biomass-based co-generating systems that produce heat and electricity for use on-site are included in this category.
- Where generation capacity is specified by the manufacturer, it shall be less than 15MW.
- For co-generation systems and/or co-fired systems to qualify under this category, the energy output shall not exceed 45 MW $_{thermal}$ e.g. for a biomass based co-generating system the capacity for all the boilers affected by the project activity combined shall not exceed 45 MW $_{thermal}$. In the case of the co-fired system the installed capacity (specified for fossil fuel use) for each boiler affected by the project activity combined shall not exceed 45 MW $_{thermal}$.
- In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the added capacity of the units added by the project should be lower than 45 MW $_{thermal}$ and should be physically distinct from the existing units.

The project activity being co-generating unit supplying heat and electricity for paper manufacture facility at Unit III of MPML shall be categorized under AMS IC.

- Rated capacity of project activity is 6MW. (<15 MW so satisfies the requirement)

Total thermal capacity of boiler is ~29MW$_{thermal}$. (<45MW$_{thermal}$, as per requirement)

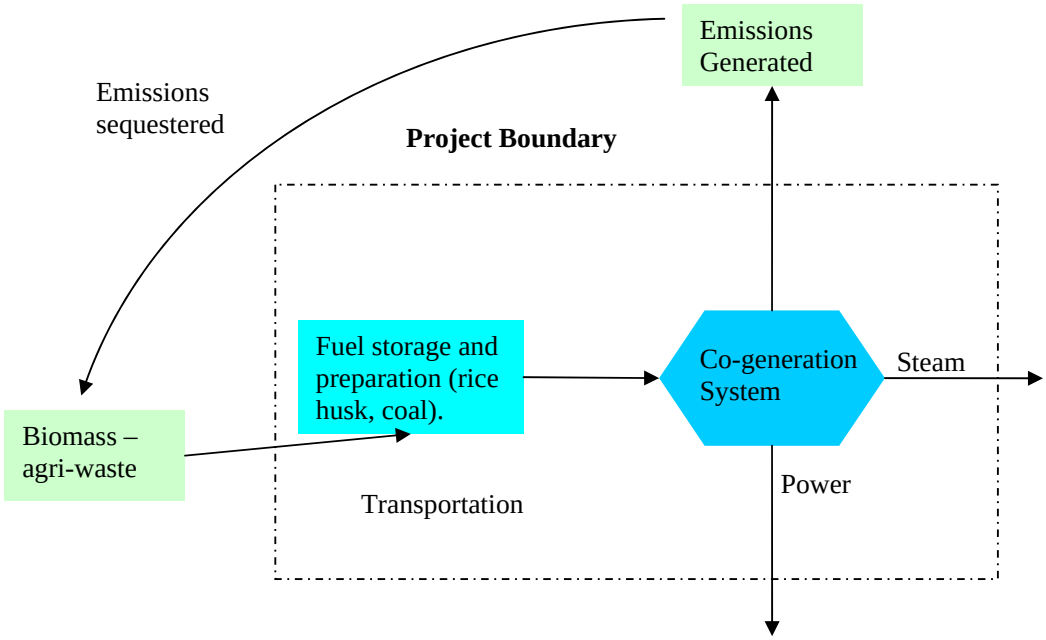
Parameter	Value	Source of data
Enthalpy of output steam @ 66kg/cm2 and 485 deg C	807 Kcal/kg	Heat Mass Balance Diagram of project

Enthalpy of feed water @ 105 deg C	105 Kcal/kg	Steam Tables
Steam Rate	35 TPH	Design rate
Boiler Energy output	(807-105) X 4.187 X 35 / 3600 = 28.6 MWh	Calculated

B.3. Description of the project boundary:

The project boundary is comprised by cogeneration plant which includes the power generation systems. Following scheme gives a brief description of project activity.
As per guidelines in Type I C of Annex-B of simplified modalities and procedures for small scale CDM project activities, project boundary encompasses the physical and geographical site of the renewable energy generation source. The project boundary includes the following:

- Fuel storage and processing
- Energy (Steam & Power) generation equipment i.e. boiler, steam turbine and generator
- Auxiliary consumption units viz. water treatment plant, de-aerator, cooling tower, circulation pump and other utility equipments.



B.4. Description of baseline and its development:

As per SSC methodology AMS IC the baseline selection is based on following:

- For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used.
- For renewable energy technologies that displace electricity the simplified baseline is the electricity consumption times the relevant emission factor calculated as described in category I.D

The project proponent had three alternatives to cater to steam and power needs for its new paper manufacturing facility. The alternatives have been listed below.

Type of requirement	**Alternative -1**	**Alternative -2**	**Alternative -3** (project activity)
Steam	Fossil fuel based co-generation	Fossil fuel fired boilers	Biomass based cogeneration
Electricity	Fossil fuel based co-generation	Grid based	Biomass based cogeneration

The baseline is comprised by either Alternative -1 or Alternative-2. Alternative-3 faces many barriers which are explained in following section and is the project activity.

At present MPML is operating Unit – I (For Kraft Paper) & II (For Newsprint) and the steam requirements is met by fossil fuel fired boilers and power requirement is met through the regional grid. Therefore Alternative-2 is the present scenario at other manufacturing units of MPML. Alternative -2 is a more conservative approach to baseline scenario as alternative-1 shall lead to higher value of baseline emissions. Hence,

- Baseline emissions for steam are fossil fuel based boilers.
- Baseline emissions for electricity requirement are as per AMS ID.

Steam

Parameter	**Value**	**Units of measurement**
Steam Rate - Extraction for process heating	19[□]	TPH
Steam Pr.	4	Ata
Steam temp.	220	Deg C
Enthalpy of output steam @ 4ata and 220C	693	Kcal/kg
Enthalpy of feed water @ 105 C	105	kcal/kg
Efficiency of boiler	85%[#]	(assumed)

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Formatte (U.K.), Su

Formatte (U.K.), Su

[□] Detail of process diagram included in Annex-3

[#] Equipment specifications, details included in Annex-3

Boiler output	370.5	TJ per annum
Fuel energy input	436	TJ per annum
EF – coal	96.1[2]	tCO2e/ TJ
Oxidation factor - coal	1.0 [3]	-
Emission factor of steam energy	113	tCO2/TJ of steam energy

Power

For electricity displaced by renewable source of power the baseline emission is estimated as electricity consumption times the relevant emission factor calculated as described in category I.D. for estimation purpose the consumption of electricity is defined as output capacity of turbine system at a load factor of 85%. Now the emission factor is estimated as per AMS ID

For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner as:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered

OR

(b) The weighted average emissions (in kg CO2/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

We have chosen option (a) and used standard value of Emission factors published by Central Electricity Authority of India (CEA) for the various regional grids. As per CEA website (http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm) the values of parameters are

Parameter	Value (tCO_2/MWh)
OM	1.01
BM	0.78
CM	0.89

The value of emission factor as per this publication is 0.89 tCO2/MWh. Details of same is discussed in Annex-3 of this PDD.

The project proponents shall be using primarily rice husk as a fuel and avoid all fossil fuel usage to the extent possible. Any coal consumption which takes place on account of start up or shortage will be part of project emissions. The quantity of coal used in project activity shall be part of monitoring plan and properly recorded.

[2] IPCC 2006 default values

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:

In accordance with paragraph 28 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology may be used for a small-scale CDM project activity and project participants shall demonstrate to a designated operational entity that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in Attachment A to Appendix B.

The additionality is explained in paragraphs to follow under different headers as listed in attachment A to appendix B.

Investment Barrier

In the present situation project proponents are using grid power at unit – I & II, which are operational. The electric supply at this location is erratic and suffers from load shedding. In its latest order MERC has directed industrial users to reduce power consumptions over previous year usages. The state of Maharashtra is presently facing a substantial power shortage. So the power is procured from other sources at higher prices, ultimately straining the users. This brings the price of grid power to a considerably high value of about Rs. 4.50 per kWh. A fossil fuel fired boiler is any ways required to fulfil steam requirements. All these considerations led the project participants to rule out alternative-2 as discussed in section B.4, which is grid supplied power and steam from fossil fired boilers.

The next options available with project proponent were cogeneration facility based either on coal or biomass. A comparison of alternatives in terms of unit cost of power generation is as below.

Parameter	Coal based co-gen	Rice Husk based co-gen	UoM
Enthalpy of output steam @ 66kg/cm2 and 485C	807	807	Kcal/kg
Enthalpy of feed water @ 105 C	105	105	Kcal/kg
Steam rate	35	35	TPH
Efficiency	85%	82%	%
Fuel Energy output	814.8	814.8	TJ/annum
Fuel Energy input	958.6	993.6	TJ/annum
Energy used in power	958.6	993.6	TJ/annum
Fuel required	60247.8	76554.1	tonnes
Landed cost of fuel	1750	1450	Rs/tonne
Annual cost of fuel	1054.3	1110.0	lac/annum
Turbine Capacity	6.0	6.0	MW
Load factor	85%	85%	%
Auxilliary consumption	10%	10%	%
Net Power generated	36352.8	36352.8	MWh
Fuel Cost per unit	2.90	3.05	Rs/KWh

The unit cost of power in case of coal based coal co-generation system is about 5% lower than if the power is generated by a rice husk based cogeneration system. So this clearly validates that coal based co-generation system would have been an obvious choice for project proponents. In the above analysis we have assumed that cost of setting up coal fired boiler based and multi-fuel fired boiler based power system is equivalent. Hence no extra cost implication due to capital cost of investment is considered. Hence above comparison is conservative in nature. The cost of setting up multi-fuel fired boiler based cogeneration system is higher as explained in following section.

The capital cost of setting up a multi-fuel fired system is also higher in comparison to setting up coal fired cogeneration unit. The following were extra capital expenditures done by project proponents that would have been avoided had the project activity involved fossil fuel fired co-generation plant.

- **Bigger size of boiler bunk:** The bulk density of coal is 800 to 850 kg/m3 in comparison to bulk density of rice husk which is 260 kg/m3. Moreover the calorific value (on GCV basis) of Coal is higher than that of rice husk. This clearly shows that a large volume of rice husk has to be fed into boiler bunk to produce a certain amount of heat. This same heat could have been produced by smaller volume of coal (less than 30% of rice husk volume) and a lot of saving on high quality steel quantity which is required to make firing bunk of boiler.
- **Storage facility of fuel:** Rice husk has a low bulk density thereby requires larger area for storage of fuel and buffer stocks. Rice husk needs to be kept in an enclosed area to avoid wind losses. This would require a walled enclosure, which would have been unnecessary for coal storage.
- **Conveyer belt for fuel transport:** The conveyer belt material requirements are dependent on density of fuel being transported across it. So the rice husk usage increases the width of belt and hence additional capital expenses.

On a conservative basis the additional capital expense incurred by project proponent is considerable when dual fired based cogeneration system is compared to fossil fired cogeneration system..

The above analysis clearly indicates that project proponents would not have decided in favour of rice husk based co-generation but for the incentive of carbon credits.

Technological Barrier

Operational problems in biomass based cogeneration have been prevalent in industry, and biomass based projects have stated these technological and operational barriers in PDDs[3]. The project proponent had apprehended similar kind of problems based on the information collected on industry sector.

Rice husk contains alkali content which is harmful to machinery, since the salts of alkalis start to deposit over boiler tubes[4] and leads to rapid erosion. The maintenance cost of equipment is thus escalated on account of fast erosion. Presence of silica content leads to corrosion of boiler tubes, portions of stack etc. the operation also requires keener observation to maintain fluidized bed thickness. The operation and maintenance requires skilled boiler operators. These operational difficulties are big deterrents to project activity. Project proponents shall cover these extra cost and efforts by utilizing the CER income. On the

[3] 1. RREPL -14MW Rice husk power project – page -23 (registered)

2. Rice Husk based cogeneration power plant –II at SBPML – page 12 (registered)

[4] http://www.trmiles.com/alkali/Alkali_Report.pdf

other hand if the proponent had gone for a coal fired boiler, there would not have been any problems related to alkali content.

Other barriers

One of the major difficulties being faced by MPML is round the year assurance and supply of biomass. MPML has planned following initiatives to ensure the same, but these shall require deployment of additional monetary and managerial resources.

- Collection points in neighbouring districts to assure timely transport of biomass to project site.
- Set up bale units to ensure cost effectiveness for the storage of rice husk.
- Deployment of personnel in neighbouring districts with high biomass availability to ensure a proper network and long term contracts.
- Plan to enter into long term contracts with rice mills. This involves high risk since MPML might have to pay for rice husk not required in a situation of non working condition of co-generation unit.
- Development of barren land for biomass cultivation if need arises and ensure biomass availability.

Even though the project scenario faces many difficulties in terms of financial, technical and managerial barriers, MPML decided to go ahead with project activity after considering income from carbon credits.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The project activity involves co-generation system constituting a multi fuel fired boiler and 6 MW steam turbine. The baseline emissions as discussed in section B.4 shall include the emissions that would have occurred in absence of project activity.

For calculating baseline emissions

Step I: Baseline emissions for steam generation.

$$\mathbf{BE_{s,y} = EF_s * S_y}$$

$BE_{s,y}$ = Baseline emissions from steam generation in year y, tCO2e
EF_s = Emission factor for steam generation tCO_2/TJ of steam energy.
S_y = cumulative steam energy generated in year y. TJ per annum

Step II: Baseline emission from power generation.

$$\mathbf{BE_{p,y} = EF_{grid} * P_y}$$

$BE_{p,y}$ = Baseline emissions from power generation in year y, tCO2e
EF_{grid} = Emission factor of grid, tCO_2/MWh. (0.89)
P_y = Power supplied in year y, MWh

Total baseline emission in a given year.

$\mathbf{BE_y = BE_{s,y} + BE_{p,y}}$

BE_y = Total baseline emissions from power and steam generation in year y, CO2e

For calculating project emissions:

$\mathbf{PE_y = \Sigma (EF_i * FF_i * NCV_i * OXID_i)}$

$PE_{.y}$ = Project emissions due to fossil fuel usage in year y, tCO2e
EF_i = Emission factor of fossil fuel type i. tCO2/TJ
FF_i = quantity of fossil fuel i consumed in year y. tonnes
NCV_i = Net calorific value of fuel i. TJ/t
$OXID_i$ = Oxidation factor of fossil fuel i.

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

Data / Parameter:	Boiler efficiency
Data unit:	%
Description:	Design Efficiency of boiler.
Source of data used:	CEA report
Value applied:	85%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Conservative approach to calculate baseline emissions.
Any comment:	

Data / Parameter:	EF coal
Data unit:	tCO_2/TJ of energy
Description:	Emission factor of coal, for calculation of baseline emissions
Source of data used:	IPCC default values for sub-bituminous coal
Value applied:	96.1 tCO2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC values are a conservative approach to calculation of emissions from fossil fuel usage.
Any comment:	

Data / Parameter:	OXID (coal)
Data unit:	-
Description:	Oxidation factor of sub-bituminous coal
Source of data used:	IPCC 2006 default values from Good practice guidelines

Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Conservative approach.
Any comment:	

Data / Parameter:	EF_{grid}
Data unit:	tCO_2/MWh
Description:	Emission factor for power generation
Source of data used:	CEA published data 21st December 2006
Value applied:	0.89 tCO2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The procedure followed by CEA is as per Baseline methodology ACM0002 version 06. The CEA has all the first hand information of generation and fuel usage, which gives a transparent and conservative estimate of CM.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The emission reductions have been calculated ex ante based on following data.

Baseline emissions calculation for steam generation

Parameter	**Value**	**Source of data**
Steam pressure at extraction	4 ata	Process requirement
Steam temperature at extraction	220 deg C	Process requirement
Steam rate	19 TPH	Process requirement
Output steam enthalpy	693 kcal/kg	Steam tables
Enthalpy of feed water	105 kcal/kg	Steam tables
Working days	330 per annum	Assumed
Working hours	24 per day	
Boiler output energy	(693-105) * 4.187 * 19* 1000 * 24 * 330 / 10^9 = **370.5 TJ / annum**	Calculation
Boiler efficiency	85%	Conservative approach
Fuel input energy required	=370.5 / 0.85 = 436 TJ / annum	Calculation

Emission factor of coal	96.1 tCO_2/TJ	IPCC default value
Oxidation factor of coal	1.0	IPCC default value
Emission factor per unit of steam energy	436 * 96.1 / 370.5 = **113 tCO_2/TJ of steam energy**	Calculation
Baseline emissions per annum	113 * 370.5 = **41878 tCO_2**	

Baseline emission calculation for Power Generation

Parameter	**Value**	**Source of data**
EF_{grid}	0.89 tCO2/MWh	CEA published data
Capacity of turbine	6 MW	Design specifications
Load factor	85%	Assumed
Auxiliary consumption	10%	Assumed
Run days	330	Assumed for continuous industry
Run hours per day	24	Assumed
Gross power generation	6 * 24 * 330 * 0.85 = 40392 MWh	Calculated
Net Power generated	40392 * (1 – 0.10) = 36353 MWh	Calculated
Baseline emissions per annum	36353 * 0.90 = **32354tCO_2 / annum**	

Project emission calculation for fossil fuel usage

Parameter	**Value**	**Source of data**
EF_i	96.1 tCO_2/TJ	IPCC value if fuel i is sub-bituminous coal.
FFi	0 tonnes	Quantity of fuel i combusted
NCVi	4514Kcal/kg	IPCC default value if fuel is sub-bituminous coal.
OXIDi	1.0	IPCC default if fuel I is coal
Project emissions in year	96.1 * 0 * 4514 * 4.187 * 1.0 / 1000 / 10^9 = 0 tCO_2	Calculated

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

Year	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**

Baseline emissions	74232	74232	74232	74232	74232	74232	74232	74232	74232	74232
Project emissions	0	0	0	0	0	0	0	0	0	0
Emission reduction	74232	74232	74232	74232	74232	74232	74232	74232	74232	74232

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

B.7.1 Data and parameters monitored:

Data / Parameter:	Steam extraction rate
Data unit:	TPH
Description:	Average extraction rate of steam for process heating
Source of data to be used:	On-site measurements
Value of data	-
Description of measurement methods and procedures to be applied:	Totalizer reading shall be used to estimate the total steam flow over the operation hours. The totalizer adds the total quantity of steam passing through it which is being used in mill for various processes. Frequency of measurement: Continuous
QA/QC procedures to be applied:	The totalizer is calibrated periodically.
Any comment:	

Data / Parameter:	Extracted Steam pressure
Data unit:	Ata
Description:	The pressure of steam at extraction outlet maintained as per process requirement
Source of data to be used:	On site measurement
Value of data	4
Description of measurement methods and procedures to be applied:	The pressure gauge maintains the pressure at extraction point as per process requirements and this reading is used to monitor the pressure of outlet steam. Frequency of measurement: Continuous
QA/QC procedures to be applied:	Calibration of gauge is done periodically
Any comment:	

Data / Parameter:	Extracted Steam temperature
Data unit:	Deg C
Description:	The temperature of steam at extraction point is maintained as per process requirements
Source of data to be used:	On site measurement

Value of data	220
Description of measurement methods and procedures to be applied:	The temperature gauge maintains the pressure at extraction point as per process requirements and this reading is used to monitor the pressure of outlet steam. Frequency of measurement: Continuous
QA/QC procedures to be applied:	Calibration of temperature gauge is done periodically
Any comment:	

Data / Parameter:	Steam enthalpy at extraction output point
Data unit:	kcal/kg
Description:	This gives an estimate of enthalpy of steam at extraction point.
Source of data to be used:	Estimated using standard steam tables
Value of data	693
Description of measurement methods and procedures to be applied:	Calculated / estimated value using pressure and temperature of steam at the extraction point.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	Boiler output
Data unit:	TJ per annum
Description:	Total energy value of steam for year y
Source of data to be used:	Calculated
Value of data	371
Description of measurement methods and procedures to be applied:	This is calculated by using steam enthalpy, feed water enthalpy and amount of steam used in process during year y. Frequency of measurement: Calculated value.
QA/QC procedures to be applied:	-
Any comment:	

Data / Parameter:	Fuel Energy Input
Data unit:	TJ per annum
Description:	Energy required in boiler for required energy in out put steam
Source of data to be used:	Calculated
Value of data	436
Description of measurement methods and procedures to be applied:	Calculated from boiler output energy and boiler efficiency. Frequency of measurement: Calculated value.

QA/QC procedures to be applied:	-
Any comment:	

Data / Parameter:	EF_s
Data unit:	tCO2/TJ of steam energy
Description:	Emission factor of steam energy used in process
Source of data to be used:	Calculated
Value of data	113
Description of measurement methods and procedures to be applied:	Calculated using emission factor of sub-bituminous coal and energy input required in boiler. Frequency of measurement: Calculated value.
QA/QC procedures to be applied:	-
Any comment:	

Data / Parameter:	Gross power generated
Data unit:	MWh
Description:	Gross power generated by turbine system over the year y
Source of data to be used:	On site measurement.
Value of data	40392
Description of measurement methods and procedures to be applied:	Meters installed with turbine setup. Frequency of measurement: continuous
QA/QC procedures to be applied:	The reading gauges are calibrated and checked periodically.
Any comment:	

Data / Parameter:	Auxiliary power consumption
Data unit:	MWh
Description:	The amount of power consumed by system as auxiliary consumption.
Source of data to be used:	On-site measurement
Value of data	4039 (assumed to be 10% of gross power generation for calculations.)
Description of measurement methods and procedures to be applied:	Meters installed with turbine setup. Frequency of measurement: Continuous
QA/QC procedures to be applied:	The reading gauges are calibrated and checked periodically.
Any comment:	

Data / Parameter:	P_y

Data unit:	MWh
Description:	The amount of power supplied to paper mill by cogeneration system
Source of data to be used:	Calculated/ Measured on site
Value of data	-
Description of measurement methods and procedures to be applied:	Calculated from Gross generation and auxiliary consumption. The meters are also provided for power being supplied and the values can be reconciled. Frequency of measurement: Continuous
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	EF_i
Data unit:	tCO2/TJ
Description:	Emission factor of fossil fuel type i
Source of data to be used:	IPCC default values
Value of data	96.1
Description of measurement methods and procedures to be applied:	The coal grade will be monitored if at all used and corresponding value from IPCC defaults to be used. The value of data used is for sub-bituminous coal quality.
QA/QC procedures to be applied:	Coal grade to be monitored on continuous basis.
Any comment:	

Data / Parameter:	FF_i
Data unit:	Tonnes
Description:	Quantity of fossil fuel type i combusted
Source of data to be used:	On site measurement
Value of data	0
Description of measurement methods and procedures to be applied:	Directly measured using weigh bridge.
QA/QC procedures to be applied:	The weigh bridges used for measuring fuels are periodically calibrated.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	Kcal/kg
Description:	Net calorific value of fossil fuel type i used
Source of data to be used:	IPCC default value
Value of data	6162 (sub-bituminous coal for estimation purposes)

Description of measurement methods and procedures to be applied:	The NCV of coal is based on grade of coal, if coal is used for project activity.
QA/QC procedures to be applied:	-
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	-
Description:	Oxidation factor of fossil fuel i.
Source of data to be used:	IPCC default value.
Value of data	1.00
Description of measurement methods and procedures to be applied:	IPCC default values for all the fuels for conservative estimate.
QA/QC procedures to be applied:	-
Any comment:	-

B.7.2 Description of the monitoring plan:

MPML has procedures for monitoring and recording data on operation & maintenance of the plant equipments. The equipments used for CDM project are part of these procedures and documents on maintenance and rectification done on all the equipments are maintained.

Unit Head is responsible for the overall functioning of the cogeneration. MPML adopts following procedures to assure the completeness and correctness of the data needed to be monitored for CDM project activity.

Formation of CDM Team:
A CDM project team is constituted with participation from relevant sections. People are trained on CDM concept and monitoring plan. This team is responsible for data collection and archiving. This team meets periodically to review CDM project activity, check data collected, emissions reduced etc. On a monthly basis, the monitoring reports are checked and discussed by the senior CDM team members/managers. In case of any irregularity observed by any of the CDM team members, it is informed to the concerned person for necessary actions. Further these reports are forwarded to the management on monthly basis.

- *Unit Head:* Overall responsibility of compliance with the CDM monitoring plan.
- *Power plant In-charge:* Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation.
- *Shift In-charge:* Responsibility of daily report generation.

Day to day data collection and record keeping:

Plant data is collected on operation under the supervision of the respective Shift-in-charge and record is kept in daily logs.

Checking data for its correctness and completeness:
The CDM team is overall responsible for checking data for its completeness and correctness. The data collected from daily logs is forwarded to the central lab after verification from respective departments.

Reliability of data collected-
The reliability of the meters is checked by testing the meters on yearly basis. Documents pertaining to testing of meters are maintained.

Frequency –
As discussed in Section B.7.1

Archiving of data-
Data shall be kept for two years after the crediting period or issuance of CERs

Calibration of instruments:
MPML maintains a log of calibration records for various instruments. Electrical / Instrumentation department in the company is responsible for the upkeep of instruments in the plant.

Maintenance of instruments and equipments used in data monitoring:
The operation department is responsible for the proper functioning of the equipments/ instruments and informs the concerned department for corrective action if found not operating as required. Corrective action is taken by the concerned department and a report on corrective action taken is maintained as done time to time along with the details of problems rectified.

Internal audits of CDM project compliance:
CDM audits shall be carried out to check the correctness of procedures and data monitored by the internal auditing team entrusted for the work. Report on internal audits done, faults found and corrective action taken shall be maintained and kept for external auditing.

Emergency preparedness:
The project activity does not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

Report generation on monitoring:
After verification of the data and due diligence on corrective ness if required an annual report on monitoring and estimations shall be maintained by the CDM team and record to this effect shall be maintained for verification.

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

The baseline and monitoring methodology was completed on 1/02/2007

Mr. Girish Malpani
CFO, **Malu Paper Mills Ltd.** (Also a project participant)

CDM – Executive Board

"Heera Plaza", 4th Floor,
Near Telephone Exchange,
Central Avenue, Nagpur
440008.
Ph: +91 712 276 0308, 277 8506
Mobile: +91 98222 27354
E-mail: gmalpani@malupaper.com

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:

27/01/2006 (Purchase orders for equipments finalized)

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

20 years

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

Fixed Crediting Period

C.2.1. Renewable crediting period

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/07/2007 (not earlier than 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:

- MPML has already obtained consent to establish from Maharashtra dated 17th July 2006.
- MPML has applied for Environmental clearance at Environment department, Mantralaya, Mumbai, Maharashtra in September 2006.
- A Rapid Environmental impact assessment was done for project site and environment management plan is in place.

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:

MPML has fulfilled the requirements stipulated under state and central laws for establishment of cogeneration plant. The environmental impacts from this project activity are moderate and have been taken care of in environment management plan. All statutory requirements have been full filled by the project proponents that are required by host party.

SECTION E. Stakeholders' comments

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

The project owners have been very responsible in getting to know the view and comments of local community for the project activity undertaken at various locations. As discussed the project is under taken at Village Heti (Surla), Taluka Saoner, District Nagpur.

The project proponents identified the following stakeholders and carried out process of stakeholder consultation.

1. Village Panchayat.
2. Local Community
3. Block level administration
4. State Authorities.

These stakeholders were asked for comments in the following manner and the comments received were compiled.

1. The village panchayat was informed through a letter to the Sarpanch and as well public display of notice in nearby area. The Sarpanch was invited for any comments on the project activity. A public Consultation meeting took place at company premises on 15th March 2007. A copy of minutes of meeting has been provided.
2. The local community of region was informed via mode of newspaper advertisement. An advertisement inviting comments and feedback on the project activity was published in local

newspaper "Lokmat" and proponents shall wait for about 3weeks time for receiving any comment on the same.

3. The development officer at block level was sent a letter explaining about the project as well asking for inputs and comments to further align project activity with sustainable development of the region. A meeting was held at office of SDO & SDM on 17th March 2007. A copy of the minutes of meeting has been provided.
4. The state pollution control board has given consent for establishment via consent dated 17/06/2006. Thus it can be concluded that state pollution control department is well aware of project activity and have given a go ahead to project proponents.

E.2. Summary of the comments received:

Summary of comments received:

- The people expressed their interest in selling agricultural waste to MPML for usage as fuel, which would also add to their income.
- The people opined that such projects are beneficial since they generate direct and indirect employment.
- There is no adverse comment received from stakeholders.

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

Since no adverse comments were received, thereby no specific actions taken.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Malu Paper Mills Limited
Street/P.O.Box:	Near Telephone Exchange, Central Avenue
Building:	4th floor, Heera Plaza
City:	Nagpur
State/Region:	Maharashtra
Postfix/ZIP:	440008
Country:	India
Telephone:	+91-712 276 0308
FAX:	
E-Mail:	gmalpani@malupaper.com
URL:	www.malupaper.com
Represented by:	
Title:	Mr.
Salutation:	CFO
Last Name:	Malpani
Middle Name:	
First Name:	Girish
Department:	
Mobile:	+91 98222 27354
Direct FAX:	
Direct tel:	
Personal E-Mail:	gmalpani@malupaper.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING OR DIRECT FUNDING FROM ANNEX-1 COUNTRIES AVAILED FOR THIS PROJECT ACTIVITY.

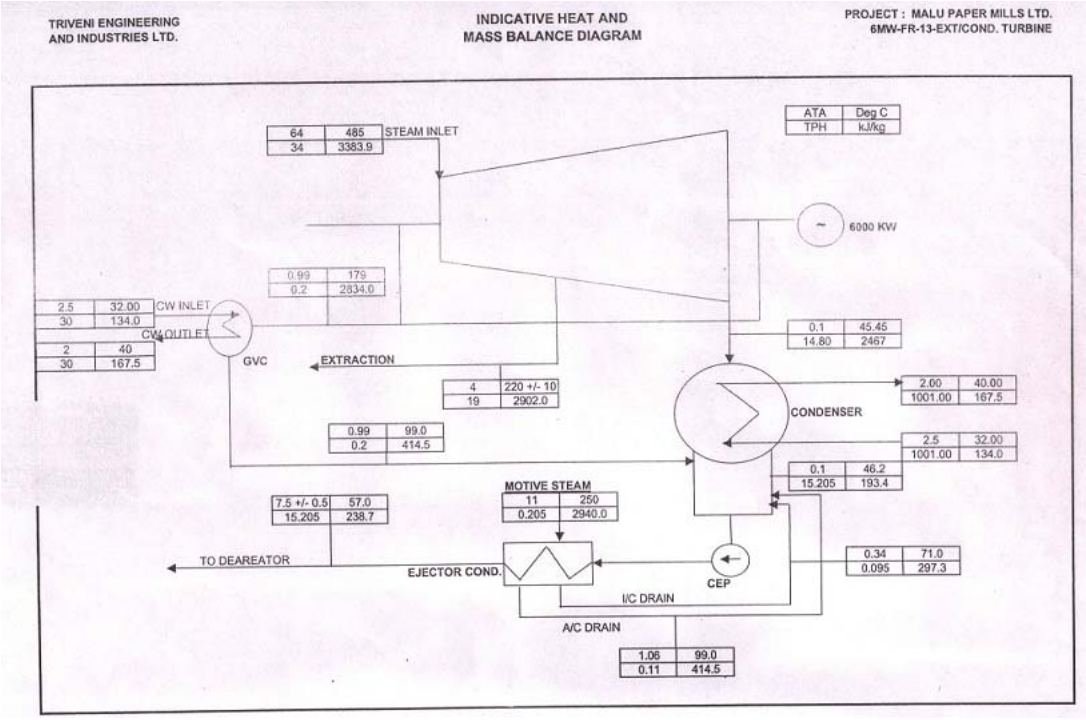
Annex 3

BASELINE INFORMATION

The baseline establishment is based on published data on Central Electricity Authority (CEA). The following are the basic attributes of the calculation procedure followed for calculation of GEF.

- GEF calculation is based on baseline methodology ACM0002 version6 and is publically available on CEA website. http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
- CEA being a central authority, undertaking of Indian government, has all the first hand information availability for calculation of GEF.
- All the assumptions and calculation models are explained in user guide for the ease of CDM applicants. http://cea.nic.in/planning/c%20and%20e/user%20guide%20ver1.1.pdf

Technical Details of Project



Heat Mass Balance Diagram

The Cogeneration system comprises of following specifications.

The entire complex of the Co – Gen Power Plant of capacity 6.0 Mw comprises of the following –

I	Fuel handling plant
II	35 TPH FBC Boiler / ESP/ Ash handling plant
III	Steam T.G.
IV	Alternator
V	Water treatment plant / Deareator, feed water storage tank
VI	Cooling Tower, recirculation pump
VII	Utility Equipments
VIII	M.S.CHIMNEY

Annex 4

MONITORING INFORMATION

Refer section B.6 and B.7 for details of monitoring plan and ex-ante calculation of Emission Reductions

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Annex 5

Biomass availability

The biomass availability was studied in the region and a concrete plan is in place to ensure biomass availability and its procurement. The region (Nagpur and three neighbouring districts) has a potential of about ~ 15MW of power generation solely based on rice husk.

The MPML is developing a concrete plan to procure rice husk from neighbouring districts with significant number of rice mills. The project proponents shall also consider usage of other biomass residues to be used as fuels. The plan shall be in place at the time of commissioning of project plant. . The following are rice growth statistics of nearby districts over the past few years.

Rice production[5] (tonnes)	Nagpur	Bhandara	Gondia	Chandrapur
2004-05	41600	124100	100400	108300
2003-04[*]				
2002-03	42100	197400	173900	109000
Average	41850	160750	137150	108650
Rice husk % of total (average)[6]	25	25	25	25
Rice husk available (tonnes)	16875	64818.5	55302.4	43810.5
Potential of power (MW)	1.42	5.4	4.65	3.7

The data suggests ample availability of rice husk in the region i.e. Nagpur and neighbouring districts of Maharashtra state. So a total potential of ~15 MW exists in the region.

[5] Government of Maharashtra, Department of Agriculture.

[*] Data Unavailable

[6] NABARD