CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

MSPPL WHR based power project at Chattisgarh, India

Version 1.2
Date: 17/08/2007

A.2. Description of the project activity:

Mahendra Sponge & Power Pvt. Ltd. ("MSPPL" hereafter) proposes utilisation of waste heat of flue gases generated in DRI kilns of its sponge iron plant located at Siltara in Chattisgarh for power generation. The power generated would be used to meet in-house power requirement of MSPPL. This will displace equivalent amount of power from the Chattisgarh State Electricity Board (CSEB) grid, which is part of Western Region (WR) grid in India and is primarily fossil fuel based. The project activity would result in reduced emissions by avoiding generation of this power in grid connected power stations.

MSPPL produces sponge iron in two kilns of 100 TPD each. Annual sponge iron production is ~60000 TPA. The two kilns generate ~25000 Nm3/hr high temperature flue gases from each kiln. The temperature of flue gases from the kiln entering into Waste Heat Recovery Boiler (WHRB) is at ~950-1000 deg C. The waste heat of flue gases will be utilised for generating steam in WHRB which would further be expanded in an extraction-condensing turbine of 8MW to generate power. Power generation from WHRB steam is equivalent to 4MW and other 4MW will be generated from steam in coal and char (from the DRI kilns) based Atmospheric Fluidised Bed Combustion (AFBC) boiler. Steam from WHRB and AFBC through a common header will be fed to the turbine to run it on rated capacity of 8 MW. In the absence of the project activity, MSPPL would have continued to draw power from CSEB grid. The project activity thus displaces equivalent amount of power generation in WR grid power stations.

The project faces many barriers to its implementation and MSPPL envisage covering the risk in the project activity with CDM backed benefit.

Sustainability aspect of the project activity:
The proposed project activity has a number of sustainability aspects as described below –

- The project activity helps reducing GHG emission in power generation in the grid, which is primarily fossil fuel based
- It helps in conservation of natural resources i.e. fossil fuels in power generation
- It generates employment during construction/ commissioning and later on operation & maintenance of the plant
- It provides the necessary impetus to other industries to come up with similar projects and become self-sustainable for their power needs
- With many projects coming up, technology suppliers/manufacturers will put in more efforts/ funds in further improvement of equipment/ machinery and help in removing existing technological barriers to implementation of such project activities.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (yes/no)
Government of India (Host)	Mahendra Sponge & Power (P) Limited (MSPPL)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Host country: India

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

District: Raipur
State: Chattisgarh

A.4.1.3. City/Town/Community etc:

Area: Siltara Steel Growth Centre

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project activity is located in Raipur District in the state of Chattisgarh. The project site is nearly ~20 km. from the nearest airport at Raipur and nearest highway is NH 200. Site is located at 21-21' N longitude and 81-40' E latitude. The physical location is depicted in the maps below –

A.4.2. Category(ies) of project activity:

Approved consolidated baseline methodology **ACM0004 "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation"**

Reference: Version 02, Sectoral Scope 01, dated 03rd March 2006

A.4.3. Technology to be employed by the project activity:

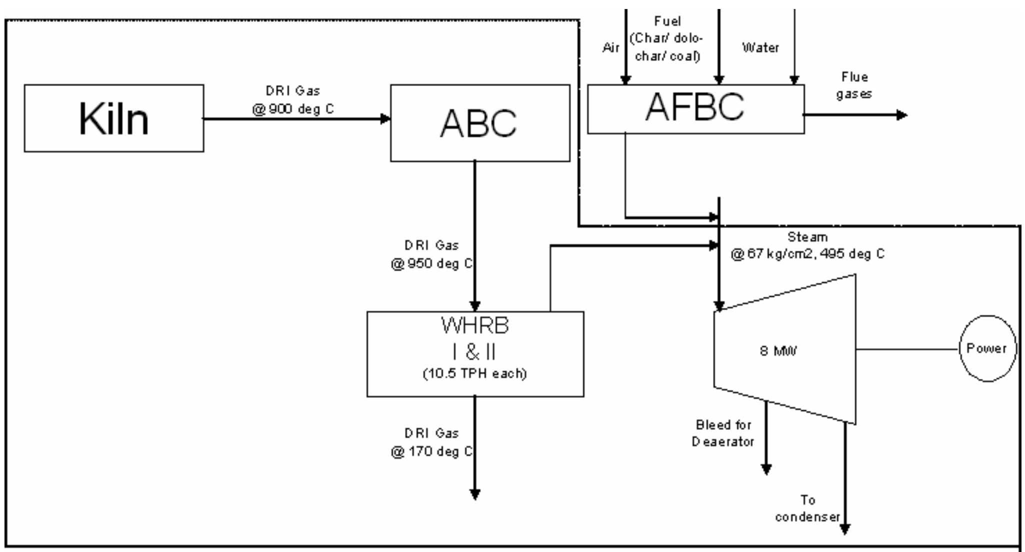
MSPPL is setting up 2X10.5 TPH WHRB for utilising high temperature heat of flue gases from DRI kilns. The temperature of flue gases post After Burning Chamber (ABC) is at ~950-1000 deg C. Steam is generated at 67 kg/cm2 and 495 deg C and expanded in one bleed cum condensing turbine of 8MW to generate power. WHRB steam generates 4 MW power equivalent. One 27 TPH Atmospheric Fluidised Bed Combustion (AFBC) boiler is also being installed, which runs on char from the kiln & coal. Steam from both WHRB and AFBC boiler through a common header is fed to turbine to run it at full rated capacity of 8MW.

Waste Heat Recovery Boiler

Capacity	10.5 TPH
Steam Pressure	67 kg/cm2
Steam Temperature	490 +- 5 deg C
Nos.	2 Nos.
Flue gas inlet temp.	950 deg C
Flue gas inlet to ESP	170 deg C
Make	Cethar Vessels

Turbine

Rated Capacity	8 MW
Steam Inlet Pressure	64 kg/cm2
Steam Inlet Temperature	485 +- 5 deg C
Nos.	1 Nos.
Bleed pressure for deaerator	4 ata
Make	Siemens



A.4.4 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tones of CO2 e
2007-08	16340
2008-09	18301
2009-10	19608
2010-11	19608
2011-12	19608
2012-13	19608

2013-14	19608
2014-15	19608
2015-16	19608
2016-17	19608
Total estimated reductions (tonnes of CO2 e**)**	191509
Total number of crediting years	10 years fixed
Annual average over the crediting period of estimated reductions (tonnes of CO2e**)**	19151

A.4.5. Public funding of the project activity:

No public funding (ODA and/ or Annex 1 countries) for the 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 project activity:

- Approved consolidated baseline methodology **ACM0004 "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation"**
  - Reference: Version 02, Sectoral Scope 01, dated 03rd March 2006

- Approved consolidated monitoring methodology **ACM0004 "Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation"**
  - Reference: Version 02, Sectoral Scope 01, dated 03rd March 2006

- **Tool for the demonstration and assessment of additionality (version 02)**
  - Reference: Version 02, dated 28 November 2005

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

Methodology	Applicability Criteria	Project Status
Approved Consolidated methodology ACM0004;	This methodology applies to project activities that generate electricity from waste heat or the combustion of waste gases in industrial facilities.	The proposed project activity is a power generation project from waste heat from DRI kilns in a sponge iron plant
"Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation"	The methodology applies to electricity generation project activities: That displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels;	The project activity displaces Chattisgarh State Electricity Board power, part of WR grid.

B.3. Description of the sources and gases included in the project boundary

For the purpose of determining GHG emissions of the **project activity**, project participants shall include:

1. CO_2 emissions from combustion from auxiliary fossil fuels

For the purpose of determining **baseline emissions**, following emission sources have been included:

2. CO_2 emissions from fossil fuel fired power plants connected to the electricity system;
3. CO_2 emissions from fossil fuel fired captive power plants supplying the project site facility;

The **spatial extent** of the project boundary comprises the waste heat or gas sources, captive power generating equipment, any equipment used to provide auxiliary heat to the waste heat recovery process, and the power plants connected physically to the electricity grid that the proposed project activity will affect.

The combined margin is calculated as described in ACM0002, both in terms of the relevant grid definitions and the emissions factors.

Following emissions sources are included in the project boundary for determination of both baseline and project emissions.

Emissions	**Source**	**Gas**		**Justification/ explanation**
Baseline Emissions	Grid electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Captive electricity generation	CO_2	Excluded	There is no captive power generation at the project site.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Emissions	On-site fossil fuel consumption due to project activity	CO_2	Excluded	No fossil fuel combustion in the project activity is envisaged.
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	CO_2 emissions from combustion from auxiliary fossil fuels Combustion of waste gas for electricity generation	CO_2	Excluded	Excluded as combustion of waste gases not required.
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

The baseline scenario alternatives include all possible options that provide or produce electricity for in-house consumption excluding baseline options that either do not comply with legal and regulatory requirements or depend on key resources such as fuels, materials or technology that are not available at the project site.

The identified possible alternative scenarios in absence of the CDM project activity would be as follows:

1. The proposed project activity not undertaken as a CDM project activity
2. Import of electricity from the grid as continuation of current scenario
3. Captive power generation based on coal
4. Captive power generation based on diesel

5. Captive power generation based on gas
6. Captive power generation based on hydro/ wind

All above options have been analyzed on whether these comply with the legal and regulatory requirements and/or depend on key resources such as fuels, materials or technology that are not available at the project site.

Power Source	Explanation
Proposed project activity from MSPPL not undertaken as CDM project activity	Energy source required in power generation in the project activity is available as waste heat in high temperature flue gases from DRI kilns of MSPPL sponge iron plant. This alternative is in compliance with all applicable legal and regulatory requirements but faces many barriers and would not have come up in the absence of CDM benefits (as detailed in section B.5) hence this option is not a baseline option.
Coal based CPP	Chattisgarh State is one of the three states (others are Orissa and Jahrkhand) which have most of the coal deposits in India. As per Ministry of Coal (http://www.coal.nic.in/), Government of India, these 3 states contribute ~70% of the total coal reserves in India and Chattisgarh's contribution is at 23%. Availability of coal for power generation in Chattisgarh is a non-issue. This is reflected by the fact that power generation based on coal combustion contributes to about 95% for utilities (Annual General Review 2004-05: Central Electricity Authority, CEA; http://www.cea.nic.in/power_sec_reports/general_review/0405/ch3.pdf). The advantages for this option are high PLF, well established technology, easily available char/dolochar and coal fines within the company and from neighbouring sponge iron industries (these are available free of cost to the project promoter). This alternative is in compliance with all applicable legal and regulatory requirements and can be a baseline option.
Diesel based CPP	Availability of diesel for DG set is not a problem in Chattisgarh and is a likely proposition for MSPPL. This alternative is in compliance with all applicable legal and regulatory requirements and can be a baseline option.
Gas based CPP	In India there are total 147 sponge iron plants based on coal and only 3 are based on natural gas. All the 3 units are based in the western part of India where plants have proximity to natural gas. (Survey of the Indian Sponge Iron Industry, JPC report, 2005-06). None of the units is based in Chattisgarh because natural gas is not available in Chattisgarh (availability of gas is restricted only to western region of India). Hence, this option is ruled out as an alternative baseline scenario.
Renewable power	This option is in line with legal and regulatory requirements of centre and state as applicable. But the sources of hydro and/ or wind are not available to the project proponent at the site; hence ruled out as plausible alternative scenario.
Import from Grid	This alternative is in compliance with all applicable legal and regulatory requirements and can be a baseline option. MSPPL had been drawing grid power prior the project activity.

Hence, identified alternatives available to MSPPL for power are following:

1. Import of electricity from the grid as continuation of current scenario
2. Captive power generation based on coal
3. Captive power generation based on diesel

Now, all three identified alternatives are compared on capital investment required and cost of power generation for each of those -

Parameter	*Grid based power*	*Coal based CPP*	*Diesel based CPP*
Capital Cost	Nil	~Rs 4.0 Crores/ MW Source: Central Electricity Authority in India.	Rs 3.5 Crores/MW Source: Central Electricity Authority in India.
Cost of Power	~Rs. 2.55 basic cost + demand charges	~Rs. 1.56/ kWh Source: Central Electricity Authority in India. The cost of power generation using coal would be lower for MSPPL as coal char, fines are available free of cost. Char from the DRI kilns is also available and that can be used along with coal as fuel to generate power in AFBC and that will further reduce the cost of power generation.	~ Rs 5.96/kWh Source: Central Electricity Authority in India.

Based on the above information it is evident that “Import of electricity from the grid” requires the minimum investment. However, unit power generation is the lowest for the coal/ char based power plants. However as grid based power has lower emission factor compared to that from coal based power generation; to be conservative “Import of electricity from the grid” has been considered as the baseline scenario in this project activity.

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 CDM project activity (assessment and demonstration of additionality): >>

Additionality of the project activity is determined based on **Tool for the demonstration and assessment of additionality** (version 02); dated 28 November 2005.

This document provides for a step-wise approach to demonstrate and assess additionality. These steps include:

1. Identification of alternatives to the project activity;

2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive;
3. Barriers analysis;
4. Common practice analysis; and
5. Impact of registration of the proposed project activity as a CDM project activity.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

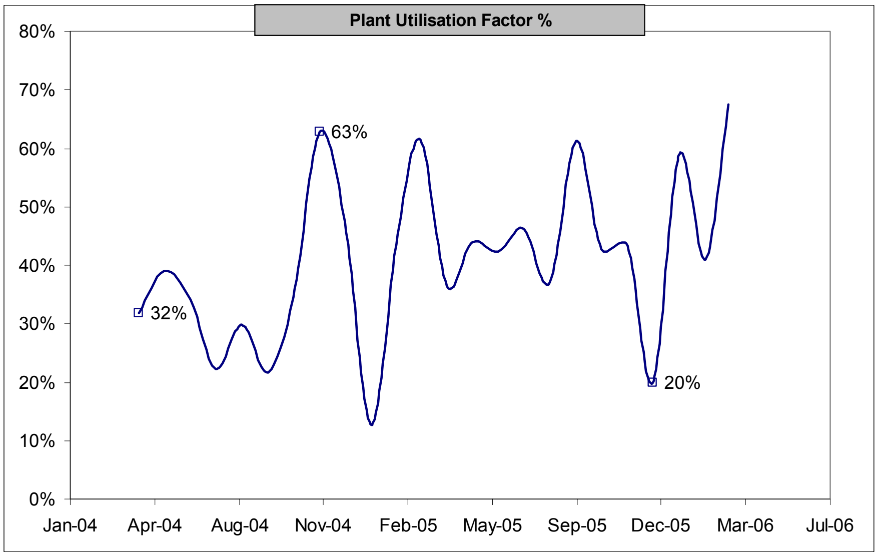
Sub-step 1a. Define alternatives to the project activity:
As explained in section B.4 following are considered plausible alternatives to proposed project activity:

1. The proposed project activity not undertaken as a CDM project activity
2. Import of electricity from the grid as continuation of current scenario
3. Captive power generation based on coal
4. Captive power generation based on diesel

Sub-step 1b. Enforcement of applicable laws and regulations:
All the alternatives listed as above are well in line with the regulatory requirements of the state and central authority in India and neither of these is prohibited from prevailing rules and regulations. Thus, all the alternatives qualify for the next step of the tool.

Step 3: Barrier Analysis

Technological barriers
Fluctuating production from kiln
Success of the proposed project activity depends on uninterrupted supply of waste gases from kilns at consistently high temperatures to waste heat recovery boilers. However, supply of these high temperature flue gases depends on continuous operation of kilns. Inconsistent availability of flue gases from kilns is a major risk for setting up a WHRB, this risk is also evident from the fact that kiln utilisation factor at MSPPL has not been quite consistent due to various reasons in recent past. This variation in production from the kiln has direct impact on quantity of coal burned in kiln and hence on the quantum of waste gas generation. Production data of MSPPL for the past 24 months shows that production of kiln has not been consistent with plant utilisation factor becoming as low as 20% over this period. Even the upper level at 63% can’t be termed as encouraging. Low capacity utilisation of kilns would have direct impact on project’s viability.



Low capacity utilization of kilns may be linked to operational problems, technological issues and unavailability of raw material for kiln operation. These reasons have been discussed in following section.

Raw material un-availability
As per the survey from Joint Plant Committee (JPC) set up by Government of India, major constraints toady faced by Indian sponge iron industry are related to raw material (availability & prices), power and to some extent labour & investments. Management of iron ore for kiln is a major hurdle in successful and continuous operation of kiln. With growing numbers of sponge iron plants, this situation will only become worse affecting small & medium industries more. A feature in Jan 2006 edition of Steel World[1] reports that 70 of 115 units in Chattisgarh went on strike in December 2005 and stopped production due to recurring shortage of iron ore. The scarcity of raw material has a direct impact on price of raw materials and that also makes the entire project risky.

Raw material quality
Availability constraint for raw material has forced industries to opt for iron ore of lesser quality. Quality of iron ore is judged on the basis of Fe content, moisture level and presence of fines in it. Fines in iron ore is not desired as most of the fines escape during reduction process from the kiln and result in more losses & low production. The presence of fines in flue gases also causes problems in WHRB operation. Similarly presence of iron ore with size larger than normal requires more coal. This leads to more load in form of particulate matter in flue gases. Also particulate matter carries some heat of coal and quantum of actual usable energy is reduced at WHRB inlet.

Problems in operation & maintenance[2]

- Handling of high particulate matter laden waste gas from kiln is tricky. High PM level causes erosion and abrasion of mechanical parts which is speeded up at high temperature of these gases.

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[1] http://www.steelworld.com/analysis0106.pdf ; "*Ban on ore exports gaining momentum*"

[2] http://www.steelworld.com/technology7.pdf ; "*Sponge Iron Industry – An overview of problems & solutions*"

Higher rate of erosion than normal may lead to more frequent changes in mechanical parts/ machinery resulting in more shutdown and/ or breakdown of system.

- Other than erosion of parts, fusion of ash and formation of clinker build up at high temperatures is another area of concern. This phenomenon is called "Accretion". Accretion leads to clinker build up inside the kiln, restricting its opening, which requires frequent cleaning and hence more kiln stoppages or shorter campaign life. Shorter campaign life directly impacts availability of waste gases for power generation in project activity. This is further affected if inferior quality of raw material is used in kiln. The problem is particularly severe to small capacity kilns with smaller sizes as in project activity.

- Presence of sulphur aggravates the situation as it restricts the temperature gradient available for utilization. For, if temperature of waste gas is brought below 170 deg C, then possibility of sulphuric acid formation in the system is increased leading to corrosion of vital machinery/ parts in down stream. This keeps a tab on extent of utilization of waste heat in the system in power generation. The presence of moisture at times complicates the situation as this speed up the formation of acid in economiser area. In case of WHRB the economiser life is reduced because of formation of sulphurous and sulphuric acid in economiser.

The above problems associated with kiln operation result in fluctuating production i.e. fluctuating quantum of waste heat availability for steam generation in WHRB. This is specific to WHRB operation only and not the case with coal/ char based AFBC boilers.

Lack of managerial resources
Power generation is not a core business activity for MSPPL and this is the first power generation project for them. MSPPL lacked expertise and experience in operation of such project activity. Operation of WHRB & turbine and synchronisation with kiln operation and production of sponge iron is perceived a big task by the project proponent as operating WHRB based power generation has specific problems as described above.

All these barriers as described above pose many obstacles for such project activity to happen and hence it is not a business-as-usual scenario.

Step 4: Common Practice
As per one report[3] conducted by Joint Plant Committee (JPC) constituted by Government of India, the total no of coal based sponge iron plants in India is 147 and gas based sponge iron plants is 3 with a cumulative capacity of 17 million tonnes. Out of 147 coal based sponge iron plants, 38 plants are located in the state of Chattisgarh. Only 16 units out of 147 have existing facilities for captive power plant. Chattisgarh has 8 of these 16 power plants. These data is indicative of the fact that despite DRI gas being of no alternative use, sponge iron plants have not opted for power plants due to the barriers as described in sections above. The DRI based power plants do face barriers which are real. Among 8 power plants in Chattisgarh, 4 have already been registered as CDM project activities[4]. Another 3 have applied for CDM

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[3] "*Survey of the Indian Sponge Iron Industry : 2005-06*" by Joint Plant Committee

[4] 4 out of 8 existing plants have registered CDM projects in Chattisgarh:

Godavari Power & Ispat Limited , http://cdm.unfccc.int/Projects/DB/SGS-UKL1139564002.3/view.html

Jindal Steel & Power Limited http://cdm.unfccc.int/Projects/DB/BVQI1143808492.42/view.html, registration and are in different stages of approval. MSPPL's project activity is a similar activity and is a fit case for CDM registration.

Step 5: Impact of CDM registration

The registration of the proposed project activity as CDM project would help in covering the risks involved with such projects. This will help in enhancing the viability of project which otherwise is affected by low PLF, unavailability of DRI gas due to shut-down or break-down and other factors. This will also encourage other sponge iron plants in Chattisgarh and on national level to come up with similar plants. This would provide the required impetus to technology providers to further their efforts towards better technology development for the use of DRI kiln gas energy in power generation. As the power generation based on WHRB is highly unstable, benefits accruing from CER sale in the project activity would provide much needed financial support.

Project Emissions

Project Emissions are applicable only if auxiliary fuels are fired for generation startup, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery Boiler.

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i$$

where:

PE_y = Project emissions in year y (tCO_2)
Q_i = Mass or volume unit of fuel *i* consumed (t or m3 or KL)
NCV_i = Net calorific value per mass or volume unit of fuel *i* (TJ/t or m3 or KL)
EF_i = Carbon emissions factor per unit of energy of the fuel *i* (tC/TJ)
$OXID_i$ = Oxidation factor of the fuel *i* (%)

Baseline Emissions

$$BE_{electricity,y} = EG_y \cdot EF_{electricity,y}$$

where:

EG_y = Net quantity of electricity supplied to the manufacturing facility by the project during the year y; MWh
EF_y = CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y; tCO_2/MWh

CO2 baseline emission factor in the baseline scenario is determined to be grid power supply, the Emissions Factor for displaced electricity is calculated as in ACM0002.

Leakage

No leakage is considered.

Monnet Ispat Limited http://cdm.unfccc.int/Projects/DB/SGS-UKL1146048256.38/view.html &

Vandana Global Limited http://cdm.unfccc.int/Projects/DB/SGS-UKL1147179019.14/view.html

Emission Reduction

$$ER_y = BE_y - PE_y$$

where:

ER_y = Emissions reductions of the project activity during the year y in tons of CO2,
BE_y = Baseline emissions due to displacement of electricity during the year y in tons of CO2,
PE_y = Project emissions during the year y in tons of CO2

Grid Emission Factor

Grid Emission Factor for Western Grid (Grid in the project activity) has been taken based on "CO2 Baseline Database for the Indian Power Sector" – Central Electricity Authority (CEA); Ministry of Power

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project Emissions

Project Emissions are applicable only if auxiliary fuels are fired for generation startup, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery Boiler.

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i$$

where:

PE_y = Project emissions in year y (tCO_2)
Q_i = Mass or volume unit of fuel *i* consumed (t or m3 or KL)
NCV_i = Net calorific value per mass or volume unit of fuel *i* (TJ/t or m3 or KL)
EF_i = Carbon emissions factor per unit of energy of the fuel *i* (tC/TJ)
$OXID_i$ = Oxidation factor of the fuel *i* (%)

Baseline Emissions

$$BE_{electricity,y} = EG_y \cdot EF_{electricity,y}$$

where:

EG_y = Net quantity of electricity supplied to the manufacturing facility by the project during the year y; MWh
EF_y = CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y; tCO_2/MWh

CO2 baseline emission factor in the baseline scenario is determined to be grid power supply, the Emissions Factor for displaced electricity is calculated as in ACM0002.

Leakage

No leakage is considered.

Emission Reduction

$$ER_y = BE_y - PE_y$$

where:

ER_y = Emissions reductions of the project activity during the year y in tons of CO2,

BE_y = Baseline emissions due to displacement of electricity during the year y in tons of CO2,

PE_y = Project emissions during the year y in tons of CO2

Grid Emission Factor

Grid Emission Factor for Western Grid (Grid in the project activity) has been taken based on "CO2 Baseline Database for the Indian Power Sector" – Central Electricity Authority (CEA); Ministry of Power

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

(Copy this table for each data and parameter)

Data / Parameter:	**CM**
Data unit:	tCO2/ MWh
Description:	Combined Margin – WR grid
Source of data used:	"CO2 Baseline Database for the Indian Power Sector" – Central Electricity Authority (CEA); Ministry of Power (2004-05)
Value applied:	0.890
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Project Emissions:

No fuel combusted during start up in waste heat recovery boiler

hence,

PEy = 0.0 tCO2e/ annum

Baseline Emissions:

Power generation capacity from waste gas = 4 MW

Plant run hours = 6000 per annum for first year & 6720 in second year and 7200 per annum for subsequent years

Load factor = 85 %

Auxiliary consumption = 10 %

Grid emission factor = 0.89 tCO2e/ MWh

Net power generation = 4 X 6000 X 0.85 X (1-0.1) = 18360 MWh per annum

Baseline emissions BEy = 18360 X 0.89 = 16340 tCO2e per annum

Emissions reduction = 16340 – 0.0 = 16340 tCO2e per annum

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

Year	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
2007-08	0.0	16340	0	16340
2008-09	0.0	18301	0	18301
2009-10	0.0	19608	0	19608
2010-11	0.0	19608	0	19608
2011-12	0.0	19608	0	19608
2012-13	0.0	19608	0	19608
2013-14	0.0	19608	0	19608
2014-15	0.0	19608	0	19608
2015-16	0.0	19608	0	19608
2016-17	0.0	19608	0	19608
Total (tonnes of CO2e)	0.0	191509	0	191509

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net power supplied to manufacturing facility due to waste heat recovery
Source of data to be used:	Plant operation data on power generation in project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	18360
Description of measurement methods and procedures to be applied:	Net power generation due to waste heat recovery from DRI kilns is calculated as explained in Annex 4 of this document. Frequency of measurement: Continuously
QA/QC procedures to	Energy meter is calibrated as per calibration frequency by eligible external

be applied:	agencies. Frequency of calibration: Yearly
Any comment:	

Data / Parameter:	**EG** $_{net, y}$
Data unit:	MWh
Description:	Net power generation from turbine
Source of data to be used:	Plant operation data on power generation in project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	36720
Description of measurement methods and procedures to be applied:	Net power generation from turbine is calculated based on Gross Power generation and auxiliary power consumption in the power plant Frequency of measurement: Continuously
QA/QC procedures to be applied:	Energy meter is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration: Yearly
Any comment:	

Data / Parameter:	**EG** $_{gross, y}$
Data unit:	MWh
Description:	Gross power generation from turbine
Source of data to be used:	Plant operation data on power generation in project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	40800
Description of measurement methods and procedures to be applied:	Gross power generation from turbine is directly measured using meters installed at the project site. Frequency of measurement: Continuously
QA/QC procedures to be applied:	Energy meter is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration: Yearly
Any comment:	

Data / Parameter:	**EG** $_{aux, y}$
Data unit:	MWh

Description:	Auxiliary power consumption in power generation plant
Source of data to be used:	Plant operation data on power generation in project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	4080
Description of measurement methods and procedures to be applied:	Auxiliary power consumption in the power generation plant is directly measured using meter installed at the project site. Frequency of measurement: Continuously
QA/QC procedures to be applied:	Energy meter is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration: Yearly
Any comment:	

Data / Parameter:	**tG_{WHRB}**
Data unit:	Tonne/ day
Description:	Steam supplied from WHRB in project activity
Source of data to be used:	Plant operation data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	120
Description of measurement methods and procedures to be applied:	Steam flow from WHRB to the turbine is directly measured using flow meters installed at WHRB outlet Frequency of measurement: Continuously
QA/QC procedures to be applied:	Flow meter is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration: Yearly
Any comment:	

Data / Parameter:	**tG_{AFBC}**
Data unit:	Tonne/ day
Description:	Steam supplied from AFBC in project activity in year y
Source of data to be used:	Plant operation data
Value of data applied for the purpose of calculating expected emission reductions in	120

section B.5	
Description of measurement methods and procedures to be applied:	Steam flow from AFBC to the turbine is directly measured using flow meters installed at AFBC outlet Frequency of measurement: Continuously
QA/QC procedures to be applied:	Flow meter is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration: Yearly
Any comment:	

Data / Parameter:	**$tG_{turbine}$**
Data unit:	Tonne/ day
Description:	Steam supplied to turbine inlet in project activity
Source of data to be used:	Plant operation data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	240
Description of measurement methods and procedures to be applied:	Steam flow to the turbine is directly measured using flow meters installed at turbine inlet Frequency of measurement: Continuously
QA/QC procedures to be applied:	Flow meter is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration: Yearly
Any comment:	

Data / Parameter:	**P_{WHRB}**
Data unit:	kg/cm2
Description:	Pressure of steam supplied from WHRB
Source of data to be used:	Plant operation data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Steam pressure is directly measured using pressure gauge installed online Frequency of measurement: Daily
QA/QC procedures to be applied:	Pressure gauge is calibrated as per calibration frequency by eligible external agencies.

	Frequency of calibration of meter: Yearly
Any comment:	

Data / Parameter:	**T_{WHRB}**
Data unit:	Deg C
Description:	Temperature of steam supplied from WHRB
Source of data to be used:	Plant operation data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Steam temperature is directly measured using temperature gauge installed online Frequency of measurement: Daily
QA/QC procedures to be applied:	Temperature gauge is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration of meter: Yearly
Any comment:	

Data / Parameter:	**P_{AFBC}**
Data unit:	kg/cm2
Description:	Pressure of steam supplied from AFBC
Source of data to be used:	Plant operation data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Steam pressure is directly measured using pressure gauge installed online Frequency of measurement: Daily
QA/QC procedures to be applied:	Pressure gauge is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration of meter: Yearly
Any comment:	

Data / Parameter:	**T_{AFBC}**
Data unit:	Deg C
Description:	Temperature of steam supplied from AFBC

Source of data to be used:	Plant operation data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Steam temperature is directly measured using temperature gauge installed online Frequency of measurement: Daily
QA/QC procedures to be applied:	Temperature gauge is calibrated as per calibration frequency by eligible external agencies. Frequency of calibration of meter: Yearly
Any comment:	

B.7.2 Description of the monitoring plan:

MSPPL will have procedures for operation and maintenance of the plant machinery & equipments and it will monitor and record data on operation & maintenance of the equipments. The equipments used for CDM project will be part of these procedures and document on maintenance and rectification done on all the equipments will be maintained.

Mr. Munish Mahajan is General Manager (GM) and responsible for the overall functioning of the sponge iron plant. MSPPL shall adopt the 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 constituted with participation from relevant departments will be responsible for data collection and archiving. This team will meet periodically to review CDM project activity, check data collected, emissions reduced etc. In case of any irregularity observed by any of the CDM team members, it will inform the concerned person for necessary actions. Further these reports will be forwarded to the management on monthly basis.

Day to day data collection and record keeping:
Plant data shall be collected on operation under the supervision of the respective Shift-in-charge and record would be 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 shall be maintained.

Frequency-

The frequency for data monitoring shall be as per the monitoring details in Section B.7.1 of this document.

Archiving of data-
Data shall be kept for two years after the crediting period (total 12 years)

Calibration of instruments:
A log of calibration records is maintained. Electrical 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 study and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date: 15/09/2006

Munish Mahajan
Mahendra Sponge & Power (P) Limited (Also a project participant)
Plot- , Phase II, Siltara Steel Growth Centre
Raipur (C.G.)
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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:

06/12/2005

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

25 years

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

C.2.1. Renewable crediting period

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

NA

C.2.1.2. Length of the first crediting period:

NA

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/07/2007 (or the date of registration whichever is later)

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

MSPPL has conducted Environment Impact assessment study for the project through a well known environment consultant. This was done as per guidelines from Ministry of Environment & Forest (MoEF).For the study an area of 10 km radius was considered around the project site. Following methodology was adopted for EIA study -

1. Study existing baseline environmental quality within impact zone
2. Identification and quantification of significant impacts on various environmental components
3. Evaluation of proposed pollution control measures and preparation of environmental management plan (EMP)
4. Delineation of post-project environmental quality monitoring plan to be undertaken by MSPPL

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:

Environment Impact Statement based on study has focussed on following environmental components likely to be affected due to project activity -

Air environment	Changes in ambient air quality on SPM, SO2 and NOx are envisaged to be negligible. The development of green belt shall also help reducing impacts due to project activity.	No adverse impact envisaged
Noise environment	Noise level of the study area varied between 38-49 dB during the day and 32-40 dB during night time. Ambient noise levels are within prescribed limits. The impact due to process unit on adjacent population is expected to be negligible. The increase in noise levels due to transportation will be insignificant.	No adverse impact envisaged
Water environment	Physico-chemical parameters of raw water are expected well within range. The water quality in impact zone was studied and it was observed that all parameters of water samples from ground water sources are below prescribed limits.	No adverse impact envisaged
Land environment	No change in existing landscape is envisaged.	In development of green belt any adverse impact will be minimised.
Socio-economic environment	No adverse impact on socio-economic component within the impact zone due to project activity. Project provides employment opportunities to local population.	No adverse impact

SECTION E. Stakeholders' comments

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

Stakeholders consulted in project activity –

- Local community
- Ministry of Environment & Forest (MoEF)
- Chattisgarh Environment Conservation Board (CECB)

Letters were sent to gram panchayat on 12/08/2006 and district authority office on 18/08/2006 in this regard. An advertisement informing general public about the project activity and inviting their views is published in daily newspaper Dainik Bhaskar on 20/08/2006. Discussions were held in one to one meeting with all concerned. For taking views of general people, a meeting was called at project site on 25/08/2006. People were told about project activity and its impact on people and environment. People enthusiastically participated in discussion and presented their views. Other reputed people are also contacted in the region on project activity.

E.2. Summary of the comments received:

All stakeholders encouraged MSPPL to come up with more such kind of project activities that help in environment conservation and development of the area. There expressed their happiness for such initiative from MSPPL. They told that this project activity will have long term positive impacts on regions environment and people.

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

No adverse comments received for project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Mahendra Sponge & Power (P) Limited
Street/P.O.Box:	Plot No –
Building:	Phase II, Siltara Steel Growth Centre
City:	Raipur
State/Region:	Chattisgarh
Postfix/ZIP:	
Country:	India
Telephone:	0771 – 2236478
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E-Mail:	mahendrasponge@rediffmail.com, mahendraagrawal@hotmail.com
URL:	
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Mahajan
Middle Name:	
First Name:	Munish
Department:	
Mobile:	91 98931 25888
Direct FAX:	0771- 2236478
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex 1 and / or ODA for the project activity.

Annex 3

BASELINE INFORMATION

Grid emission factor for the Western Grid is taken as suggested in "**CO2 Baseline Database for the Indian Power Sector"** by Central Electricity Authority (CEA), Ministry of Power, Government of India.

The value for Combined Margin for Western Grid (grid in the project activity) is given as 0.890 tCO_2e/ MWh.

Annex 4

MONITORING INFORMATION

Power generation from WHRB:
In the project activity, steam from WHRB and coal based AFBC is fed to the turbine through a common header. Steam flow meters are installed at respective boiler outlets and also at turbine inlet. Gross power generation from turbine is measured directly. Net generation is calculated by deducting auxiliary power consumption from gross power generation. The quality of steam from WHRB and AFBC i.e. temperature and pressure are same and so power linked with WHRB steam will be calculated pro-rata for the fraction of total steam supplied to the turbine.

Data to be monitored:

1. Steam quantity from WHRB in project activity to common header
2. Steam quantity from AFBC to common header
3. Steam quantity at turbine inlet
4. Gross power generation from turbine in power plant
5. Auxiliary power consumption in power plant
6. Pressure and temperature from WHRB and AFBC boilers

Calculation for net power generation attributable to steam from WHRB in project activity:

Step1: Net power generation from turbine in project activity

Net power generation from turbine = Gross power generation – aux power consumption

Step 2: Fraction of steam energy supplied due to WHRB

Option 1:
Fraction of steam energy from WHRB = Steam energy supplied from WHRB to common header / total steam energy input at turbine inlet from common header

Option 2:
Fraction of steam energy from WHRB = (total steam energy input at turbine inlet from common header - Steam energy supplied from AFBC to common header)/ total steam energy input at turbine inlet from common header

Choose from option 1 & option 2; whichever is less. This gives conservative estimations as any loss of steam in the way to turbine has been accounted towards WHRB steam.

Step 3: Net power generation from WHRB steam

Net power generation due to WHRB = Fraction of steam from WHRB X net power generation from the turbine

Estimation of steam energy Steam energy = Quantity of steam X Steam enthalpy