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:

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Power generation from waste heat of submerged arc furnaces
Version: 05
Date: 02/01/2008

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A.2. Description of the project activity:

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Purpose

Jindal Stainless Limited (JSL) is setting up a 1.6 million tonnes per annum capacity greenfield integrated stainless steel plant for production of stainless steel slabs and hot and cold rolled products, using liquid ferro-chrome. The stainless steel plant has two numbers of semi-open submerged arc furnaces (SAF) for manufacturing of ferro-chrome. The project activity involves utilization of heat of the hot gases emanating from the two SAFs to produce steam and thereby generate power in a captive power plant. The total electricity demand of the manufacturing facility is increasing as new facilities are getting commissioned, it being a greenfield manufacturing facility. The electricity demand of the manufacturing facility will be met by the up-coming coal based power plant. Currently the total electricity demand at the site is approximately 55 MW which is being met from grid supply till the time the coal based captive power plant (250 MW) gets commissioned. The project activity will meet the energy requirements of the unit only partially and the remaining demand will be met through the supply from the coal based captive power plant. In the absence of the project activity the heat contained by these gases would have been wasted through air cooling and vented to the atmosphere after de-dusting.

Thus the purpose of the project activity is to recover the sensible heat of the waste gases emanating from the furnaces and thereby generate steam and power for in-house consumption.

Project Activity's contribution to Sustainable Development

The JSL project activity assists in sustainable development as follows:

Social well being

The project activity will result in generation of employment both during the construction phase of the waste heat recovery based power generation units and the operation phase wherein people will be required to operate the generation units once it gets commissioned. In the absence of the project activity, no such employment generation would have occurred either during the construction phase or the operational phase.

Economic well being

The project activity would help in reducing the energy requirements by effectively utilizing the heat of waste gases. Recovery of waste heat will have a direct effect on the efficiency of the process and will result in reduction in the utility consumption & costs, and process cost.

Environmental well being

The project activity will help positively in the direction of global climate change by avoiding the generation of greenhouse gases which would have occurred in the absence of the project activity. As the project activity would be replacing the fossil fuel based power generation, it will support towards the conservation of fossil fuels and natural resources.

Technological well being

The technology stated for use in the project activity represents environmentally safe and sound technology for the application. The equipments, for the project activity, will be supplied by well established equipment manufacturers in the Indian market.

Thus it is ensured that the project activity is in-line with the sustainable development criteria given by the Indian Government. It has positive contribution towards the stipulated indicators.

A.3. Project participants:

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Name of Party involved* ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	The Party involved wishes to be considered as project participant (Yes/No)
Government of India (host)	Jindal Stainless Limited (JSL)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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The project activity is being implemented in JSL's integrated steel plant at Duburi, Orissa

A.4.1.1. Host Party(ies):

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India

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

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Orissa

A.4.1.3. City/Town/Community etc:

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Village Duburi, District Jajpur

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

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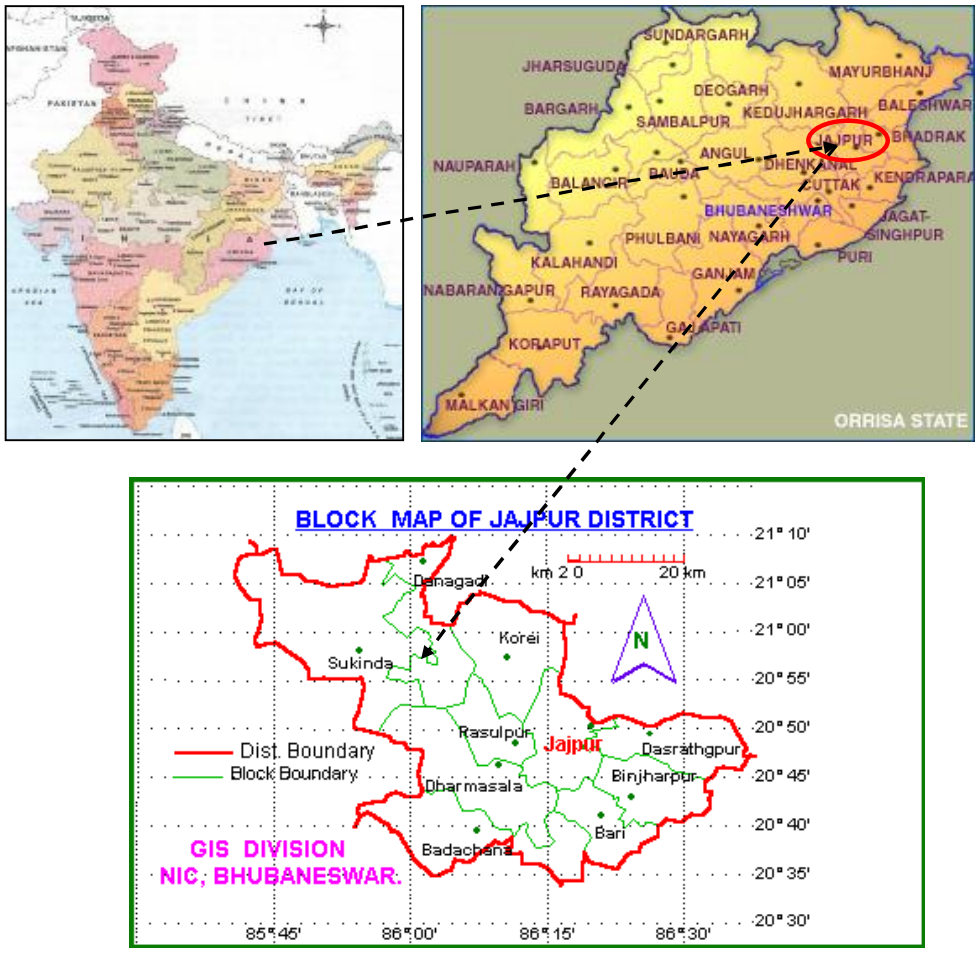
The project activity is located in the integrated steel plant of JSL in village Duburi, district Jajpur, Orissa. The site lies between 20^0 N 53" and 20^0 N 59" latitude and 86^0 E 00" and 86^0 E 05" longitude. The project activity is located about 80 km north from the city of Cuttak. The

proposed site is well connected through rail and road. The integrated steel plant area is bounded by South Eastern Railway's line connecting Jakhapura and Daitari on the east and the Jajpur Talcher state highway on the north. The proposed site is about 360 km by rail from Kolkata, 160 km from Paradip port and 110 km from Bhubneshwar. The location of the project activity on the map of India is as follows:



Location of the Project Activity (map not to scale)

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

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The project activity is a large scale potential CDM project which fits under the Category 1: Energy Industries (renewable / non-renewable sources) as per "List of Sectoral Scopes", Version 04.

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

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The technical specifications of the key units in the project activity are as follows:

Waste heat recovery steam generators (2 No.s)

Type : Single pressure, natural circulation and outdoor type
Steam output : 28.5 tonnes per hour
Steam pressure : 42 kg/cm^2
Steam temperature : 405^0C

Steam turbine

Type : single cylinder, condensing cum extraction type
Capacity : 13 MW

Electrical generator

Type : Water cooled
Frequency : 50 Hz
Power factor : 0.8
Voltage : 11 kV

The technology of the furnaces has been provided by SMS-Demag and the boilers and turbines are being provided by well established power plant suppliers. The technology being used in the project activity is safe and sound without any significant adverse impact on the environment. No transfer of technology is involved in the project activity.

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

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Years	Annual estimation of emission reductions in tonnes of CO_2e
2007 – 08	75,187
2008 – 09	75,187
2009 – 10	75,187
2010 – 11	75,187
2011 – 12	75,187
2012 – 13	75,187
2013 – 14	75,187
2014 – 15	75,187
2015 – 16	75,187
2016 – 17	75,187

Total estimated reductions (tonnes of CO_2e)	**751,870**
Total number of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**75,187**

A.4.5. Public funding of the project activity:

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No public funding from parties included in Annex – I is involved in 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:

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Title: "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation"

Reference**:** UNFCCC Approved consolidated baseline methodology **ACM0004 / Version 02**, Sectoral Scope: 01, 3rd March 2006.

The approved methodology also draws upon and "Version 03 of the tool for demonstration and assessment of additionality"

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

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The methodology ACM0004 is applicable to project activities that generate electricity from waste heat or the combustion of waste gas in industrial facilities.

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;
- where no fuel switch is done in the process where the waste heat or the waste gas is produced after the implementation of the project activity

The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity, as well as to planned increases in capacity during the crediting period.

The proposed project activity would be supplying power to the stainless steel manufacturing facility of JSL. The manufacturing facility is also coming up with a coal based captive power generation. The cost of per unit generation from coal based captive power plant (approximately INR 2.50/kWh) is lower as compared to the purchase of power from grid (approximately INR 3.25/kWh). Thus the project activity would be displacing fossil fuel based captive power generation.

The waste gases are generated from the ferro-chrome manufacturing furnaces. The project activity does not result in any change in the furnace process. The waste gases emanating from the furnaces are passed through the waste heat recovery boilers.

Thus the project activity satisfies all the applicability conditions as specified in the methodology ACM0004, thence the said methodology is applicable for the project activity.

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

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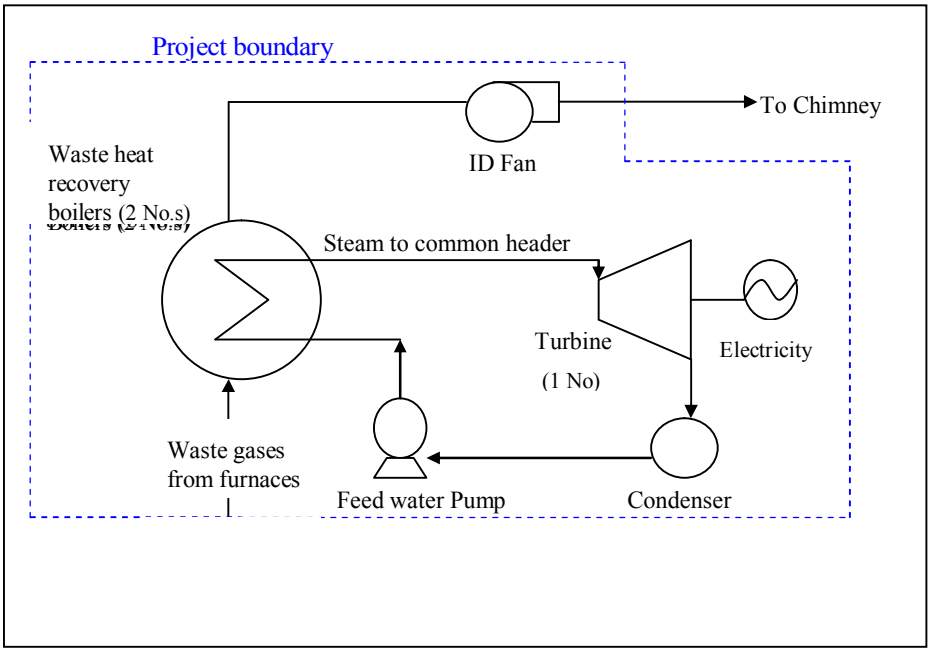
The definition of project boundary states that the project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases (GHG) under the control of the project participants that are significant and reasonably attributable to the CDM project activity.
As per ACM0004, for the purpose of determining GHG emissions of the project activity, project participants need to include:

- CO_2 emissions from combustion from auxiliary fossil fuels

As discussed earlier that there is no provision of auxiliary fossil fuel firing in the project activity so there are no project activity related emissions. The project boundary related to ACM0004 as applied to the project activity comprises of the WHRBs, turbines and the auxiliaries as shown in the following figure:



The project boundary starts from supply of waste gases at the boiler inlet to the point of electricity generated by the project activity. The sources and gases included in the project boundary is summarised in the following table:

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid electricity generation	CO_2	Excluded	In this case since coal based captive power generation is the baseline so the emissions for the same have been included and grid has been excluded.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Captive 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.
Project Activity	On-site fossil fuel consumption due to the project activity	CO_2	Included	May be an important emission source. Although in this project activity since the boilers are un-fired type so there is no auxiliary fossil fuel consumption hence no such emissions.
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Combustion of Waste gas for electricity generation	CO_2	Excluded	The waste gases are containing only sensible heat and cannot be fired.
		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:

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Identification of alternative baseline scenarios consistent with current laws and regulations:

The methodology as applied to the project activity involves the identification of alternative baseline scenarios that provide or produce electricity for in-house consumption excluding options that:

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

(a) The proposed project activity not undertaken as a CDM project activity;

(b) Import of electricity from the grid;

(c) Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc;

(d) A mix of options (b) and (c), in which case the mix of grid and captive power should be specified

(e) Other uses of the waste heat and waste gas

(f) The continuation of the current situation, whether this is captive or grid-based power supply (if not already included in the options above).

Among the alternatives that do not face any prohibitive barriers, the most economically attractive alternative should be considered as the baseline scenario.

Alternative a: The proposed project activity not undertaken as a CDM project activity

JSL may set up a waste heat recovery based electricity generation at its facility for meeting in-house requirements. This alternative is in compliance with all applicable legal and regulatory requirements. However, this alternative faces a number of barriers (as detailed in subsequent Section B.5) making it predictably prohibitive. Hence this option is not a part of baseline scenario.

Alternative b: Import of electricity from the grid

In this alternative net electricity being produced by the project activity gets generated by the regional grid. Thus an equivalent amount of CO_2 emissions would take place at the thermal power plants supplying power to the Eastern region electricity grid. This alternative is in compliance with all applicable legal and regulatory requirements and can be a credible baseline scenario.

Alternative c: Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc

An equivalent power being supplied by a coal based captive power plant put up at JSL. This alternative is in compliance with all applicable legal and regulatory requirements and can be a part of baseline option. Also since the coal based captive power generation is an economically attractive option so the same can be the baseline scenario. JSL is putting up a coal based power plant for meeting the in-house requirement of power.

Alternative d: A mix of options (b) and (c), in which case the mix of grid and captive power should be specified

Since coal based captive power generation is economically more attractive as compared to grid power, so JSL would be opting for captive power generation.

Alternative e: Other uses of the waste heat and waste gas

The heat contained in the waste gas can be used for other heating purpose or steam generation. Although this alternative is in compliance with all the applicable legal and regulatory requirements, it faces the barriers. Since the waste gases are high in dust content thus any heat extraction process would be facing similar barriers as depicted in subsequent section B.5. Hence it cannot be a part of the baseline scenario.

Alternative f: The continuation of the current situation, whether this is captive or grid-based power supply (if not already included in the options above).

JSL being a Greenfield manufacturing facility is presently meeting its in-house power requirement through grid supply. This being a temporary arrangement till the coal based captive power generation facility gets commissioned. Therefore alternative f may be excluded from baseline scenario.

Among all these alternatives, the one that does not face any prohibitive barrier and is the most economically attractive should be considered as the baseline scenario. Thus from the above identified alternatives, it can be found that alternatives c – coal based captive power generation is

the most likely alternative for the baseline scenario. Further the emission factor of the coal based captive power generation (0.9128 tCO_2/MWh) is lower that the emission factor of Eastern grid (1.06 tCO_2/MWh)[1] and this is conservative.

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):

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The project activity would be generating electricity through the recovery of sensible heat from the waste gas emanating from the submerged arc furnaces. In the absence of the project activity, the gas would have been released through the stack after conditioning without any heat recovery. Thus due to the project activity, electricity will be generated without any GHG emissions. This electricity will be displacing the fossil fuel based captive power generation.

The project activity would be generating around 823.68 GWh of electricity over a period of 10 years and hence would result in CO_2 emission reduction of **751,870** tonnes of CO_2.

Currently no national or sectoral policy is existent in India that promotes waste heat recovery in the ferro-chrome submerged arc furnace in steel industry[2] or stated in the draft national steel policy[3]. Thus without any regulatory imposition and as a sustainable development measure, JSL is going forward for waste heat recovery power generation.

JSL wishes to have the crediting period after the registration of their project activity. The power generation activity from the project would only start in the year 2007. JSL has considered the incentive from the CDM before the start of the project activity and the evidence for the same can be verified by the DOE. The crediting period would be starting after the date of registration. The additionality of the project activity has been established as follows:

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

Sub-step 1a. Define alternatives to the project activity;

Sub-step 1b. Enforcement of applicable laws and regulations.

Referring to section B.4., the alternatives available to JSL are:

- Equivalent electricity generation from the grid
- Equivalent coal based captive power generation

All these alternatives are in line with the applicable laws and regulations and thus can be part of the baseline scenario, however equivalent electricity generation from coal based captive power generation is the most economically attractive scenario and hence chosen as the baseline scenario.

Step 2: Investment analysis

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

[2] http://www.envfor.nic.in/cc/inisector.htm

[3] http://steel.nic.in/spolicy.pdf

Or
Step 3: Barrier analysis

JSL proceeds to establish project additionality by conducting the Step 3: Barrier Analysis.

The project proponent is required to determine whether the proposed project activity faces barriers that:
(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives through the following sub-steps:

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity

The project activity had its associated barriers to successful implementation. These barriers are detailed below:

Technological barriers

Technology for the ferro-alloy furnaces is being obtained from SMS-Demag. Such types of systems are not existent in India. The furnaces are coupled with the power generation activity. Although the ferro-alloy furnaces are being provided by SMS-Demag the technology for waste heat recovery boilers is indigenous. This would require technology integration for successful operation. Also for ensuring continuous power generation consistent supply of waste gases at requisite heat value to the WHRB would be required. This would require proven technology and trained man-power to operate such kind of system. JSL will have to get people trained, to operate and maintain the system for ensuring consistent waste heat supply such that reliable power generation through the waste heat recovery of the furnaces from ferro-alloy making process takes place. The dust being carried away in the waste gases are chromium laden and this is likely to cause frequent failure of the boiler tubes and the fans. As the ferro-alloy furnaces are semi-open type thus it is very important to maintain the draught in the furnaces. The project activity will also impact the draught conditions of the furnace because of the waste heat recovery boiler. Any sudden disturbance in the draught will upset the whole process; It may damage the refractory walls of furnaces (due to sudden thermal shock), frequent breakdowns, non uniform flow and temperature, inconsistent operation, hampered productivity and thereby the power generation. Thus the project activity faces higher risks of failure as well as increased maintenance cost as compared to coal based captive power generation.

Further the temperature of the waste gases emanating from the ferro-alloy furnaces also not at a relatively very high temperature. The maximum temperature of the waste gases is expected to be around 550 ^{0}C. Due to the tapping process of the furnace to extract the molten alloy the quantity and quality of the waste gases is expected to vary (the temperature of the waste gases would get lowered).

Thus due to these reasons the waste gases from the ferro-alloy furnaces are not utilized and this is further substantiated by the prevailing practice barrier.

Barriers due to prevailing practice

Power generation from waste gases of ferro-alloy furnaces is non-existent in India. Moreover even in the ferro-alloy sector the furnaces being put up by JSL is the first of its kind in India. Power generation from the hot gases coming out of the furnaces is not being practised in India. Most of the ferro-alloy furnaces are located in the Eastern and Southern India due the proximity of ore availability primarily based in Orissa, West Bengal and Andhra Pradesh. The list of ferrochrome units in India is as follows:

Name of units	Location	Transformer Capacity (MVA)
Name of Units in Orissa		
Ferro Alloys Corporation Limited	Randia	45
Balasore Alloys Limited	Balasore	75
Indian Metals & Ferro Alloys Limited	Theruballi	35
Nava Bharat Ventures Limited	Denkenal	45
Tata Steel Limited	Bamnipal and Cuttak	66
IDCOL Ferro Chrome & Alloys Limited	Jajpur	15
Jindal Stainless Limited	Jajpur	120
Rohit Ferro Tech Limited	Dubari	66
Indian Charge Chrome Limited	Choudwar	48
Visa Steel Limited	Kalinganagar	32
Name of Units in West Bengal		
Sri Vasavi Industires Limited	Bishnupur	28
Rohit Ferro Tech Limited	Bishnupur	15
Shyam Ferro Alloys Limited	Durgapur	24
Name of Units in Andhra Pradesh		
Ferro Alloys Corporation Limited	Garividi	58.5
Nava Bharat Ventures Limited	Vizag	45
Andhra Ferro Alloys Limited	Vizag	6.8
Jindal Stainless Limited	Kothavalasa	23.5
GMR Industries Limited	Srikakulam	15
Name of Units in Other States		
SAL Steel Limited	Ahmedabad, Gujarat	24
PEE EL Alloys Limited	Bari Brahmana, Jammu	3.125
Tawi Chemicals Industries	Bari Brahmana, Jammu	1.45
Jindal Steel & Power Limited	Raigarh, Chhattisgarh	24

None of these units have any system for utilizing the waste heat of the gases emanating from the ferro-chrome furnaces for power generation. The technology of recovering the waste heat from waste gas of submerged arc furnace and utilizing the same for captive power generation is a novel technology in the Indian Ferrochrome sector. The JSL project activity would be the first kind in

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Deleted: alloy furnaces

Deleted: of significant size apart from JSL, present in the region are as follows:

Deleted: Name of Unit

Deleted: The JSL project activity would be the first kind in the region with an integrated waste heat recovery power generation unit.

India with an integrated waste heat recovery power generation unit. The same has been certified by The Indian Ferro Alloy Producers' Association (IFAPA). IFAPA is an apex body representing manufacturers of Bulk and Noble Ferro Alloys in the country established in 1961. The Association is involved in promoting, protecting the interests common to the Ferro Alloy producing community, collection of statistical information, database and other information relating to the Industry; representations to the Chambers of Commerce Mercantile Associations and other Public Bodies in India or outside India, etc.

Since the project activity is the first of its kind so there are uncertainties pertaining to its operation. The problems associated with the project activity are:

- Boiler tube failures due to corrosive dust laden flue gases
- Low plant load factor due to variation in flue gas temperature and flow
- Integration of the furnaces with the power plant for smooth operation

The CDM revenues will help overcome the unforeseen problems associated with this first of its kind initiative.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)
The barriers to the project activity are not applicable to the other identified alternatives as they are the prevailing practices and business as usual scenario.

Step 4: Common Practice analysis:
Based on the information about activities similar to the proposed project activity, the project proponent is supposed to carry out common practice analysis to complement and reinforce the barrier analysis. The project proponent is required to identify and discuss the existing common practice through the following sub-steps:

Step 4a: Analyze other activities similar to the proposed project activity
Step 4b: Discuss any similar options that are occurring
No other activity of similar type as the JSL project activity is existent in Indian ferrochrome industry. As explained in the barrier analysis above the JSL project activity is the first of its kind in the India ferrochrome sector. No other submerged arc furnace unit has come up with waste heat recovery based power generation. The technology of recovering the waste heat from waste gas of ferro-chrome submerged arc furnace and utilizing the same for captive power generation is a novel technology taken up by JSL. Thus it is clear that the project activity is not at all a common practice in the country.

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The registration of the project activity as a CDM project and financial benefits accrued thereby will help overcome the unforeseen problems associated with this first of its kind initiative and would encourage other entities in similar nature of work to pursue such kind of initiatives. The CDM revenues will help compensate the risks associated with lower plant load factor, boiler tube failures, integration of the technologies related to ferro-chrome furnace and the waste heat recovery based power generation unit and any other disturbances caused by the project activity leading to adverse impact on the ferro-chrome furnace and production thereby. Also it might trigger industries in other sectors to look into their processes and identify opportunities wherein

waste heat recovery would be materialised. Thus CDM registration would result in reducing GHG emissions and promoting new and cleaner technology.

Based on the above steps, it may be satisfactorily concluded that the JSL project activity is not a baseline scenario and hence is clearly additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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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.

The waste gas emanating from the submerged arc furnace is not having any calorific value and hence cannot be fired in a furnace. Moreover there is no provision of auxiliary fuel firing in the project activity (the boilers are unfired type), thus there would not be any emissions in the project activity.

Baseline Emissions

As the baseline scenario is determined to be captive power supply, the Emissions Factor for displaced electricity is calculated as per option 1 given in the methodology as follows:

Option 1. If baseline scenario is captive power generation

Since the baseline scenario is determined to be captive power generation, the Emission Factor for displaced electricity is calculated as follows:

$$EF_{captive,y} = \frac{EF_{CO2,i}}{Eff_{captive}} \times \frac{44}{12} \times \frac{3.6TJ}{1000MWh}$$

Where:

$EF_{captive,y}$	Emission factor for captive power generation (tCO_2/MWh)
$EF_{CO2,i}$	CO_2 emission factor of fuel used in captive power generation (tC/TJ)
$Eff_{captive,y}$	Efficiency of captive power generation (%)
$44/12$	Carbon to Carbon Dioxide conversion factor
$3.6/1000$	TJ to MWh conversion factor

To estimate overall power plant efficiency[4], Option A has been opted wherein the highest value will be chosen as a conservative approach among the following three values:

1. Measured efficiency prior to project implementation;

[4] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_PFXP9WP7HPZELQNB9GKH5MB46RHZEW

2. Measured efficiency during monitoring;
3. Manufacturer Nominal data for efficiency of the existing captive power generation.

Baseline emissions are given as:

$$BE_y = EG_y \times EF_{captive,y}$$

Where:

EG_y	Net quantity of electricity supplied to the manufacturing facility by the project during the year y in MWh, and
EF_y	CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y (tCO_2/MWh)

The net quantity of electricity supplied is calculated as:

$$EG_y = EG_{Gen} - EG_{Aux}$$

Leakage
No leakage is considered in accordance with ACM0004.

Emission Reduction
The emission reduction ER_y by the project activity during a given year *y* is the difference between the baseline emissions though substitution of electricity generation with fossil fuels (BE_y) and project emissions (PE_y), as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y	Emissions reductions of the project activity during the year *y* in tons of CO_2,
BE_y	Baseline emissions due to displacement of electricity during the year *y* in tons of CO_2 and
PE_y	Project emissions during the year *y* in tons of CO_2,

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

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All parameters related to emission reduction calculations will be monitored throughout the crediting period.

B.6.3 Ex-ante calculation of emission reductions:

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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. **S**ince no auxiliary fuels will be fired in the proposed project activity, project activity emissions are not applicable.

Baseline Emissions
Baseline emissions are given as:

$$BE_y = EG_y \times EF_{captive,y}$$

As the baseline scenario is determined to be captive power generation, the Emissions Factor for displaced electricity is calculated as to be **912.8 tCO_2/GWh.** The details of the calculations are provided in Annex 3.

EG_y i.e. Net units of electricity due to WHR substituted in the grid during the year y (in GWh) is calculated as follows:

Year	Power generation capacity (MW)	Plant load factor (%)	Auxiliary Power consumption (%)	Working days per year	Hours of opera-tion per day	Net Electricity generation (GWh)
2007-08	13	90	10	330	24	82.368
2008-09	13	90	10	330	24	82.368
2009-10	13	90	10	330	24	82.368
2010-11	13	90	10	330	24	82.368
2011-12	13	90	10	330	24	82.368
2012-13	13	90	10	330	24	82.368
2013-14	13	90	10	330	24	82.368
2014-15	13	90	10	330	24	82.368
2015-16	13	90	10	330	24	82.368
2016-17	13	90	10	330	24	82.368
Total						**823.68**

The baseline emissions are calculated to be **75,187** tCO_2 annually over the 10 year crediting period. The emission reduction ER_y by the project activity during a given year *y* is the difference between the baseline emissions though substitution of electricity generation with fossil fuels (BE_y) and project emissions (PE_y), as follows:

$$ER_y = BE_y - PE_y$$

As the project activity emissions PE_y are nil, the emission reductions are equal to the baseline emissions.

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

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Year	Project activity emissions (tonnes of CO_2e)	Baseline emissions (tonnes of CO_2e)	Leakage (tonnes of CO_2e)	Emission reductions (tonnes of CO_2e)
2007-08	0	75,187	0	75,187
2008-09	0	75,187	0	75,187
2009-10	0	75,187	0	75,187
2010-11	0	75,187	0	75,187
2011-12	0	75,187	0	75,187
2012-13	0	75,187	0	75,187
2013-14	0	75,187	0	75,187
2014-15	0	75,187	0	75,187
2015-16	0	75,187	0	75,187
2016-17	0	75,187	0	75,187
Total (tonnes of CO_2e)	**0**	**751,870**	**0**	**751,870**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_{GEN}**
Data unit:	GWh/yr
Description:	Total electricity generated
Source of data to be used:	Onsite instrumentation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	92.664
Description of measurement methods and procedures to be applied:	Monitoring location: meters at plant and DCS will measure the data. Manager In-charge would be responsible for regular calibration of the meter, which would be carried out annually. The energy meters used for measuring electricity generation would be of 0.5% accuracy level. Continuous monitoring and hourly logging of gross power generation will be carried out.
QA/QC procedures to be applied:	All measurements should use calibrated measurement equipment that is maintained regularly and checked for its functioning. The parameters related to the performance of the project will be monitored using meters and standard testing equipment, which will be calibrated regularly following standard industry practices.
Any comment:	Monitoring location: meters at plant and DCS will measure the data. Manager In-charge would be responsible for regular calibration of the meter, which would be carried out annually.

Data / Parameter:	**EG_{AUX}**

Data unit:	GWh/yr
Description:	Auxiliary Electricity
Source of data to be used:	Onsite instrumentation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	10.296
Description of measurement methods and procedures to be applied:	Monitoring location: meters at plant and DCS will measure the data. Manager In-charge would be responsible for regular calibration of the meter, which would be carried out annually. The energy meters used for measuring auxiliary electricity consumption would be of 0.5% accuracy level. Continuous monitoring and hourly logging of auxiliary power consumption will be carried out.
QA/QC procedures to be applied:	All measurements should use calibrated measurement equipment that is maintained regularly and checked for its functioning. The parameters related to the performance of the project will be monitored using meters and standard testing equipment, which will be calibrated regularly following standard industry practices.
Any comment:	Monitoring location: meters at plant and DCS will measure the data. Manager In-charge would be responsible for regular calibration of the meter, which would be carried out annually.

Data / Parameter:	**EG_y**
Data unit:	GWh/yr
Description:	Net Electricity supplied to facility
Source of data to be used:	Calculated (EG_{GEN} - EG_{AUX})
Value of data applied for the purpose of calculating expected emission reductions in section B.5	82.368
Description of measurement methods and procedures to be applied:	The net electricity supplied to the facility would be calculated from the monitored values of gross generation and auxiliary consumption of the power plant.
QA/QC procedures to be applied:	This data is calculated, so does not need QA procedures
Any comment:	-

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tC/TJ
Description:	CO_2 emission factor of fuel used in captive power generation
Source of data to be used:	National sources or IPCC defaults
Value of data applied for the purpose of calculating	26.1

expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The Natcom report is India's Initial National Communication to the UNFCCC and the figure of emission factor for coal is to be taken from the Natcom report. Annual monitoring of this data would be carried out.
QA/QC procedures to be applied:	This data is given in the Natcom report (National source) and does not need QA/QC procedures
Any comment:	-

Data / Parameter:	$Eff_{captive,y}$
Data unit:	%
Description:	Efficiency of captive power generation
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	37.78
Description of measurement methods and procedures to be applied:	The parameters related to the performance of the captive power plant will be monitored using meters and standard testing equipment, which will be calibrated regularly following standard industry practices. Monthly monitoring of the efficiency of the captive power plant would be carried out. The higher efficiency among the name plate and monitored value will be used for emission reduction estimations. The efficiency of the captive power plant will be calculated by dividing the net power generation by the energy provided by coal. The energy provided by coal would be based on the net quantum of coal used and the net calorific value of the coal. The net power generation would be the difference between the gross and auxiliary power.
QA/QC procedures to be applied:	All measurements shall use calibrated measurement equipment that is maintained regularly and checked for its functioning.
Any comment:	-

B.7.2 Description of the monitoring plan:

>>

The methodology requires the project participant to monitor the following for the project activity:

- Net electricity generation from the proposed project activity;
- Data needed to calculate the emissions factor of captive power generation.

The project activity will have the monitoring of the generation of the total electricity generated and the auxiliary electricity thereby enabling the calculation of the net electricity supplied to the facility. As there will be no fossil fuel consumption in the project activity so monitoring of the same would not be required.

Further, for monitoring the baseline scenario, internal audited records for captive power generation, fuel consumption, generation efficiency and other relevant details would be monitored. Hence, the transparency of measurements, recording, monitoring and control of the generation is ensured all the time. These records can be used for verification of generation mix and emission factor for baseline calculation for a particular year.

The Plant Manager is responsible for monitoring and archiving of data required for estimating emission reductions. He would be supported by the shift in-charge who would continuously monitor the data logging and would generate daily, monthly and annual reports.

The detailed description of the monitoring plan is provided in Annex 4.

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)

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Date of completion *(DD/MM/YYYY)*:
24/05/2007

Name of responsible person/entity:
Project participant - Jindal Stainless Limited. The contact details are given in Annex 1.

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:

>>
12/08/2004

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

>>
25 years

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

>>
Fixed crediting period of 10 years

C.2.1. Renewable crediting period

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

>>
Not Applicable

C.2.1.2. Length of the first crediting period:

>>
Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
12/11/2007 or after the date of registration of the project activity

C.2.2.2. Length:

>>
10y-0m

SECTION D. Environmental impacts

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

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JSL has carried out an environmental impact assessment (EIA) study for the expansion project covering the waste heat recovery based power plant. No significant adverse impacts and trans-boundary impacts are arising due to the project activity. JSL has submitted the EIA and other related documents to the Ministry of Environment and Forests (MoEF), Government of India, and subsequently MoEF has accorded environmental clearance to the project. The EIA report and the environmental clearance can be checked by the designated operational entity during validation.

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:

>>

No significant environmental adverse impacts are arising due to the project activity (In fact the consideration of usage of waste gases from the furnaces for production of power has been taken due to its positive environmental contribution).

The impacts on the environment associated with the coming up of the project activity during construction phase and operation phase are as follows:

Construction Phase Impacts

The impacts arising due to the construction phase are short term, marginal and reversible in nature. The identified key issues related to physical and social environment during this phase and the associated management plan to mitigate the negative impacts are as follows:

Employment Generation: The project activity would be providing employment to the local work force during the construction as well as the operational phase of the project activity.

Dust Suppression: Due to movement of construction machinery and vehicles, dust will be generated. Dust will be suppressed by regular water sprinkling and suitable road surface treatment to ease traffic flow.

Noise Pollution: Vehicle movement will generate noise. The movement will be avoided during night time. All construction vehicles and machinery will be properly maintained to generate less noise.

Topography: The terrain of the land for the proposed project activity gradually slopes down from north-west to south-east direction. This will not alter the drainage pattern of the site and surroundings. It will be ensured that adequate drains and garland drains are constructed keeping

proper alignment in conformity to the existing drainage pattern so that the alteration is kept to the minimum and flooding, etc., does not occur. No building materials will be extracted from the site.

Land Use: The project activity is planned in the manufacturing plant of JSL and no further land acquisition is required.

Greenery Development: Extensive greenery development is planned to be undertaken by JSL over the years. The greenbelt development program will continue even after the establishment of the project activity.

Operation Phase Impacts

During operation phase of the project activity the identified key issues related to physical and socio-cultural environment and the associated management plan to mitigate the negative impacts are as follows:

Air Pollution: The project activity is not leading to any (further) contribution to the atmospheric emissions, because these emissions would have occurred in the absence of the power plant also. Had the project activity not been in place, or the waste heat recovery boilers are bypassed, then the atmospheric emissions would have been much more significant as the temperature of the gases coming out of the submerged arc furnace is very high. The project activity helps in reducing this thermal load by bringing the gas temperature down and also effectively utilizing it for power generation purpose, thus resulting in reduced greenhouse gas emissions. Further, suitable stack heights will be provided for proper dispersion of exhaust gases.

Noise Pollution: During the operation stage, noise will be generated from turbines and other moving machines. To keep the noise levels at minimum and reduce its adverse impact on the surrounding areas following measures will be undertaken:

- Reduction of noise at the source
- Providing acoustic lagging for the equipment and suction side silencers
- Providing vibration isolators
- Low noise equipments will be selected
- People working in areas where noise reduction is not feasible will be given proper protective gears (ear plugs/muffs etc.)

This would ensure that the prescribed national standards are maintained.

Water Pollution: Since the project is designed for water re-circulation system hence there will be essentially negligible wastewater discharge associated with the project activity. All the wastewater generated will be reused leaving no scope for any wastewater discharge outside the plant premises. Thus the project activity will not result in any kind of water pollution.

Solid Waste: No solid waste would be generated due to the project activity and thus there would not be any impact on the soil quality.

Land Use Pattern: The land acquired for the project site has not resulted in any displacement or resettlement of people. The land is not forest land. Hence no significant impact on the land use

pattern of the area is anticipated. Also, this land allocated for the project activity is within the acquired land by JSL.

Ecology: No wild life sanctuary or national park or biosphere reserve is located near the project site.

Socio-economics: Establishment of any project leads to socio-economic changes. Influx of population leads to change in economic status of the community. People from the surrounding villages would be recruited in the project activity. In order to prevent the degradation of physical and aesthetic environment, proper sanitation facility and other basic facilities like drinking water supply and sewerage will be provided. Thus there would be positive impact on the socio-economic conditions due to generation of direct and indirect employment during construction and operation phase.

SECTION E. Stakeholders' comments

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

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The local stakeholder comments were invited by conducting a public hearing. Notification through regional and national newspapers for public hearing was brought out requesting the stakeholders to participate and communicate any suggestions/objections regarding the project activity in writing. For widespread publication, on 27th May 2006, an advertisement in the daily newspapers was given for the public hearing. On 30th June 2006, public hearing was conducted as per provision of Environmental Impact Assessment Notification, 1994 (as amended) for the project activity. The public hearing for the project of JSL was held at Vyasnagar town hall, Jajpur road, Jajpur. In an official notice in accordance with the regulations public hearing was scheduled in presence of a formed panel. The proceeding of the public hearing along with objections/suggestion etc., were received in writing.

E.2. Summary of the comments received:

>>

No significant adverse comments were raised during the public hearing. Moreover, the people have welcomed the project being taken by JSL.

The objections/suggestion made by the panel members and local people were related to the greenbelt development, peripheral development in the fields of infrastructure development (road), employment generation, providing training, education, health, social development and water table conservation.

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

>>

Overall the local stakeholders were appreciative of the project activity as it would provide additional employment and development of the region. JSL would take necessary steps towards the greenbelt development and peripheral developments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Jindal Stainless Limited
Street/P.O.Box:	12, Bhikaji Cama Place
Building:	Jindal Centre
City:	New Delhi
State/Region:	New Delhi
Postfix/ZIP:	110066
Country:	India
Telephone:	+91 11 26188340 - 50
FAX:	+91 11 41659169
E-Mail:	jindalsp@del3.vsnl.net.in
URL:	www.jindalstainless.com
Represented by:	
Title:	Sr. Vice President
Salutation:	Mr.
Last Name:	Pandiya
Middle Name:	Kumar
First Name:	Sanjeev
Department:	Finance
Mobile:	+91-9810080777
Direct FAX:	+91 11 26180256
Direct tel:	+91 11 41462114
Personal E-Mail:	sanjeev.pandiya@jindalsteel.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no recourse to any public funding by the project participants for the project activity.

Annex 3

BASELINE INFORMATION

The baseline for the project activity is coal based captive power generation; therefore the emission factor would be dependant on the efficiency of the coal based captive power plant, and the emission factor of coal. These parameters are as follows:

The efficiency of the coal based captive power generation is calculated as follows:

Boiler efficiency: 86.83%
Turbine heat rate: 1976 kcal/kWh
Thus the efficiency of the power plant works out to be as follows:

$Eff_{captive}$ (%) = (86.83 x 3600/(4.187 x 1976))
= 37.78%

The emission factor of coal is 26.1 tC/TJ

Using the formula as given in section B.6.1. the emission factor works out to be as follows:
$EF_{captive}$ = 912.8 tCO2/GWh

Description	**Value**	**Units**
Emission factor of fuel used for captive power plant (coal)	26.1	tC/TJ
Boiler efficiency	86.8	%
Turbine heat rate	1,976.0	kcal/kWh
Efficiency of power plant	37.78	%
Emission factor of coal based captive power plant	**912.8**	**tCO_2/GWh**
Power plant capacity	13	MW
Annual operating hours	7,920	hours/year
Plant load factor	90	%
Auxiliary power consumption	10	%
Gross power generation annually	92.664	GWh
Auxiliary power consumption	10.296	GWh
Net power generation annually (Gross -Aux)	**82.368**	**GWh**
Annual emission reduction	**75,187**	**tCO_2**

Annex 4

MONITORING INFORMATION

The monitoring plan has been prepared in accordance with in ACM0004. The project activity being a waste heat recovery based power generation one, there are no project emissions generated during operation of the project activity.

The monitoring methodology will essentially aim at measuring and recording electricity generation through devices, which will enable verification of the emission reductions achieved by the project activity that qualifies as Certified Emission Reductions (CERs). The methods of monitoring adopted should also qualify as economical, transparent, accurate and reliable.

The project activity will employ state of the art monitoring and control equipments that will measure, record, report and control various key parameters like total power generated, power used for auxiliary consumption, flow rate, temperature and pressure parameters of the steam generated and steam sent to turbine for generation of power. The monitoring and controls will be part of the Distributed Control System (DCS) of the entire plant. All instruments will be calibrated and marked at regular interval to ensure accuracy.

Project factors affecting emission reduction claims

The potential factors that may affect the emission reduction claims are: -

Frequency of monitoring: -

The emission reduction generated by the project is calculated by multiplying the total unit electricity generated by the appropriate Emission Factor calculated on the basis of current baseline scenario. Therefore it is important to meter the net generation of power produced on real time basis. Thus such parameters that directly influence the total revenue generated from the emission reduction calculation by the project will be monitored on continuous basis through online monitoring system in place.

Reliability: -

The amount of emission reductions achieved by the project is dependent on the net energy generated from the project as well as baseline emission factor. Therefore meter readings calculating the final value of total electricity produced from the project side will be monitored with calibrated instruments. Calibration as per instrument specifications shall ensure reliability of measures. All power-measuring instruments will be calibrated once a year for ensuring reliability of the system.

Registration and Reporting: -

Registration of data will be online in the control cabin through a microprocessor. Hourly data logging in log sheets in hard copies will be there in addition to software memory. Daily, monthly and annual reports will be prepared stating the generation.

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