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

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Annexes

Appendix

SECTION A. General description of project activity

A.1. Title of the project activity:

Title : Waste heat recovery at blast furnace of IISCO, SAIL
Version: 06
Date : 14/10/2011

A.2. Description of the project activity:

Steel Authority of India Limited (SAIL) is a leading steel-making company in India. It is a fully integrated iron and steel maker, producing both basic and special steels for domestic construction, engineering, power, railway, automotive and defence industries and for sale in export markets. IISCO Steel Plant a part of Steel Authority of India Limited has planned to go for new Greenfield steel plant of capacity 2.5 MT/ year of hot metal production in Burnpur, west Bengal. As a part of the Greenfield project IISCO Steel Plant is coming up with a new blast furnace of capacity 4060 m^3 along with a waste heat recovery system at the hot stoves for pre heating Combustion Air (CA) and Blast Furnace Gas (BF gas).

Purpose of the Project activity:

The project activity involves the installation of waste heat recovery system at the hot blast stoves of Blast furnace that recovers the waste heat in flue gases from hot stoves. The recovered heat is then utilized for the pre-heating of the combustion air and BF gas. The waste flue gas from hot blast stoves will be at a maximum flue gas temperature of 400^0C and normal flue gas temperature of 150^0C to 200^0C. Heat exchangers will be used for the recovery of heat from the waste flue gas leaving the stoves.

While the temperature of exhaust gas is reduced from 400^0C to 150^0 C this heat recovery system enables the recovery of the sensible heat of exhaust gas and it is utilised to pre-heat BF gas and combustion air. The BF gas temperature has been increased from 35^oC to 180^oC and the combustion air temperature has been increased from 25^oC to 180^oC.This results in higher hot blast temperature and reduced BF gas consumption in hot stove.

Baseline Scenario:
In the absence of the project activity, hot stoves of IISCO Steel Plant would have been used excess BF gas for producing the same quantity of hot blast.

Emission Reduction:
The project activity reduces GHG emissions into the atmosphere that would have otherwise been emitted due to combustion of excess BF gas in the hot stove. The project activity is expected to recover 683.15 TJ of waste heat per year. The project activity approximately reduces 64,626 tonnes CO_2e of GHG emissions annually.

Project's Contribution to Sustainable Development
The project contributes towards sustainable development and the well being of the region in terms of environment, socio-economic condition and technology and therefore is in line with host country guidelines on sustainable development.

Social well being:

- The project activity is expected to generate employment opportunities for both skilled and unskilled people during the construction as well as after commissioning.

- The project activity also leads to the improved working conditions at the plant with reduced fossil fuel combustion.

Economic well being:

- The project activity will lead to the reduced consumption of coal, thereby, reducing dependence of import of fossil fuel.

Environmental well being:

- The project activity is estimated to reduce GHG emission in the atmosphere. The project activity also lowers SO_2 & N_2O emissions and associated environmental degradation. Thus, this project aids in environmental well being.

Technological well being:

- With the project activity, the company upgrades its technology through improved instrumentation and improved technology usage. This project activity involves the transfer of technology from Germany. Proper education and training will be imparted to the managerial and operational staff for improving their knowledge base and to ensure proper operation of the unit. In addition the project activity would introduce a cleaner and energy efficient technology by enabling utilization of waste heat energy in process waste gas steams. Moreover, the project activity being not a common practice among other steel manufacturing industries of India there is a high replication potential of this technology in the country.

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)**
India (HOST)	Steel Authority of India Limited (Public Sector Undertakings)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

India

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

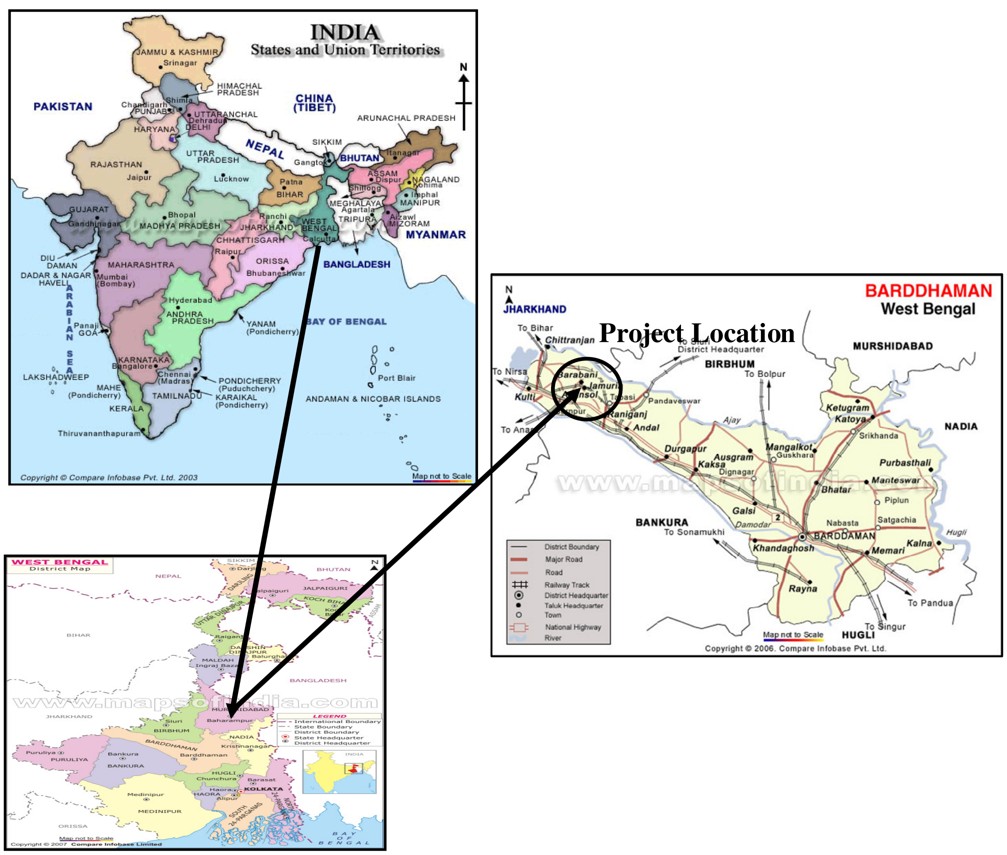
State: West Bengal

A.4.1.3. City/Town/Community etc.:

City : Asansol
Town : Burnpur
District: Barddhaman

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

The project is located in IISCO Steel Plant, Asansol in West Bengal state (23^{o} 40' 33.89" N, 86^{o} 55' 21.68" E), in Eastern India. The nearby railway station is Asansol and the nearby airport is Kolkata. Burnpur PIN – 713 325.



1. http://www.mapsofindia.com/lat_long/westbengal/westbengal.htm

Source: Google Earth

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

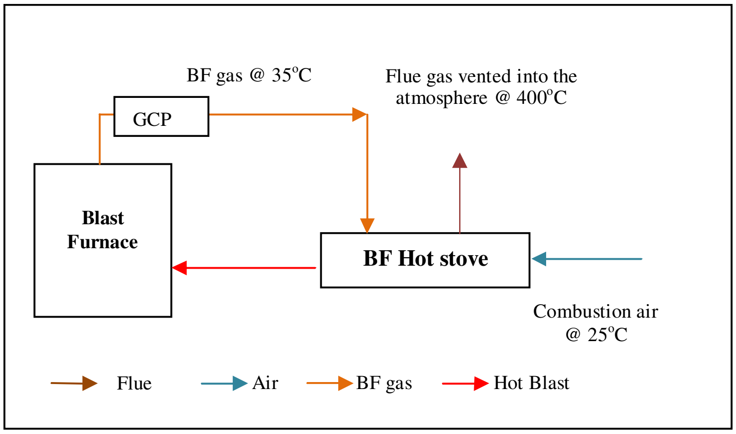
Scope number : 01 & 04
Sectoral Scope : Energy Industries & Manufacturing Industries

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

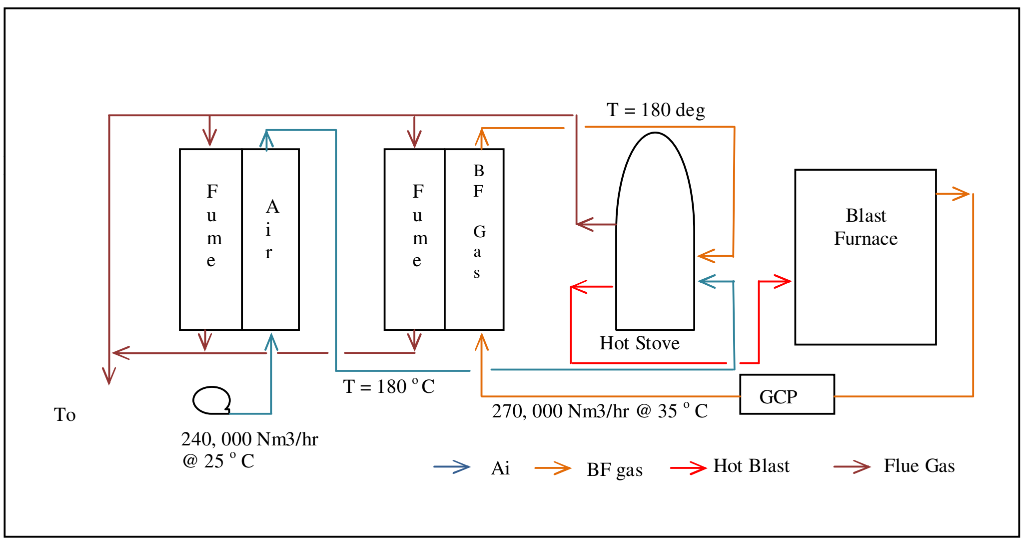
The project activity involves the installation of waste heat recovery system, recovering heat from the hot stove flue gases to preheat the combustion air and BF gas. Three numbers of hot blast stoves will be provided for supply of adequate hot blast temperature at 1200^{0}C. The flue gas from hot blast stoves will be of a maximum flue gas temperature of 400^{0}C and normal flue gas temperature of 150^{0}C to 200^{0}C. The waste heat recovery system will consists of heat exchangers, expansion joint, a main burner, air/gas control sets, flame ignition system, valve manifolds and local control cabinet.The thermic fluid is heated in the Heat Exchanger by the stove flue gas at 400^{0}C coming from the stove stack. The heated thermic fluid passes through two Heat Exchangers to impart the heat to combustion air and BF gas. The thermic fluid is thus cooled and the condensate returned to the lower hot side of the heat pipes and cycle repeats. As the process takes place by convection; there is no use of power for the circulation of thermic fluid inside the heat exchanger.

Since the installation of waste heat recovery system at the hot stoves of blast furnace is a new initiative within SAIL it requires extensive initial training for plant employees and operators of heat exchanger for efficient maintenance and operation.

Baseline Scenario:



Project Scenario:



The heat exchangers design data are tabulated below:

Heat Exchanged in Gas Heat Exchanger				
Parameters	Unit	Value		
Volume (m)	Nm^3/hr	270000		
Specific Heat (C)	$KJ/kg.^0C$	1.03		
Δ T	^0C	145		
Calorific value of BF Gas	Kcal/Nm3	914		
Total Energy Input/flow	Kcal/hr	246780000		
Density (ρ)	kg/m^3	1.25		
Load factor	%	85%	Gcal/hr	10.23526

Heat Exchanged (H1)	TJ/year	359.8961625	TJ/hr	0.042845
Heat Exchanged in Air Heat Exchanger				
Parameters	Unit	Value		
Volume (m)	Nm^3/hr	240000		
Specific Heat (C)	$KJ/kg.^0C$	1.01		
Δ T	^0C	155		
Density (ρ)	kg/m^3	1.205	Gcal/Hr	9.193292
Load factor	%	85%	TJ/hr	0.038483
Heat Exchanged (H2)	TJ/year	323.2582164		
Net Quantity of Heat Supplied (H1 + H2) = 683.15 TJ/year				
NOTE: Heat Exchanged, H = m * C * Δ T * ρ *PLF				

Technology transfer:

This project activity involves transfer of technology from Germany. This technology is state of the art when compared to the conventional practice in the Indian steel sector. This technology requires extensive initial training to ensure efficient operation of the plant during the project period. Considering the above fact this technology is safe and sound.

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

Years	Annual estimation of emission reduction in tonnes of CO_2e
2011	64,626
2012	64,626
2013	64,626
2014	64,626
2015	64,626
2016	64,626
2017	64,626
Total estimated reductions (tonnes of CO_2e)	452,385
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	64,626

A.4.5. Public funding of the project activity:

There is no public funding involved in this project

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:

Title : **"Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects"**
Methodology : ACM 0012
Version : 3.2
Reference : http://cdm.unfccc.int/UserManagement/FileStorage/0M4N9567GH1J7UAJ89YNQ299K1MYSI

Title : Tool for the demonstration and assessment of additionality
Version : 5.2.1
Reference : http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

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

Since this project activity is a Greenfield activity and utilization of waste heat for preheating the fuel gas and combustion air, it falls under Type – 1 activities of ACM 0012 version 3.2.

Applicability Criteria	Project activity
As per the Methodology ACM 0012 version 3.2 all the waste energy in identified WECM stream/s, that will be utilized in the project activity, is, or would be flared or released to atmosphere in the absence of the project activity at the existing or new facility. The waste energy is an energy source for: (a) Cogeneration; or (b) Generation of electricity; or (c) Direct use as process heat; or (d) For generation of heat in elemental process (e.g. steam, hot water, hot oil, hot air). (e) For generation of mechanical energy	The project activity involves the installation of waste heat recovery system that recovers the waste energy in flue gases from blast furnace hot stoves for generation of heat in elemental process (preheating combustion air and BF gas).
If the project activity is based on the use of waste pressure to generate electricity, electricity generated using waste pressure should be measurable.	Since the project activity involves the utilization of waste heat for preheating BF gas and combustion air, this scenario is not applicable.
Energy generated in the project activity may be used within the industrial facility or exported from the industrial facility.	Energy generated in the project activity is used within the industrial facility.
The electricity generated in the project activity may be exported to grid or used for captive purposes.	The project activity involves the utilization of waste heat for preheating BF gas and combustion air and there is no electricity generation hence this scenario is not applicable.
Energy in the project activity can be generated by the owner of the industrial facility producing the waste energy or by a third party (e.g. ESCO) within the industrial facility.	Energy in the project activity is generated by the owner of the industrial facility.
Regulations do not constrain the industrial facility that	There are no regulations preventing the use of BF

generates waste energy from using the fossil fuels prior to the implementation of the project activity.	gas for energy generation prior to the implementation of the project activity.
The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility.	The project activity is a Greenfield activity involves installation of waste heat recovery system at the hot stove of the blast furnace.
The emission reductions are claimed by the generator of energy using waste energy;	The emission reductions will be claimed by the generator of energy using waste energy.
In case the energy is exported to other facilities an agreement is signed by the owner's of the project energy generation plant with the recipient plant(s) that the emission reductions would not be claimed by recipient plant(s) for using a zero-emission energy source.	The energy generated from the waste energy is used within the industrial facility.
For those facilities and recipients, included in the project boundary, which prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods: • The remaining lifetime of equipments currently being used; and • Credit period.	• The lifetime of the equipment is more than 20 years. • Renewal crediting period has been applied for this project. • Considering the above credits are claimed up to the crediting period of the project.
Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the plant shall not be accounted for.	Waste energy that is released under abnormal operation of the plant will not be accounted for.
This methodology is not applicable to projects where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel generator) to generate power. However; the projects recovering waste energy from such power plants for the purpose of generation of heat only can apply this methodology.	Since the project activity involves the utilization of waste heat for preheating BF gas and combustion air, hence this scenario is not applicable.
It shall be demonstrated that the waste energy utilized in the project activity was flared or released into the atmosphere (or wasted in case of project activity recovering waste pressure) in the absence of the project activity at the existing facility by either one of the following ways: • By **direct measurements** of energy content and amount of the waste gas for at least *three years* prior to the start of the project activity. • **Energy balance** of relevant sections of the plant to prove that the waste gas/heat was not a source of energy before the implementation of the project activity. For the energy balance	This will be demonstrated by the following option: • This demonstration is not applicable to this project activity, since this project activity is a green field project. (Please refer AM_CLA_0156)

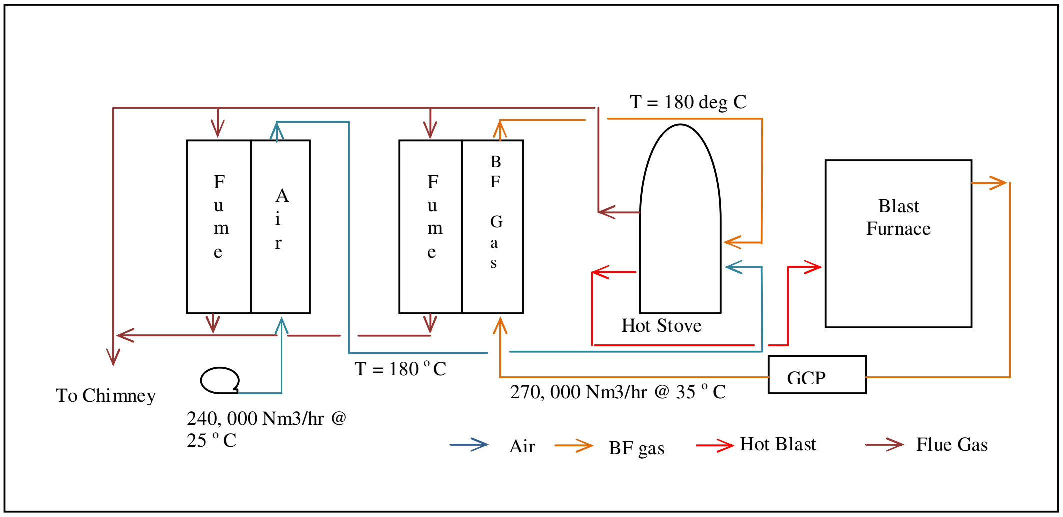
the representative process parameters are required. The energy balance must demonstrate that the waste gas/heat was not used and also provide conservative estimations of the energy content and amount of waste gas/heat released. • **Energy bills** (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g. based on specific energy consumption specified by the manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g. balance sheets, profit and loss statement) that no energy was generated by waste gas and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities. • **Process plant** manufacturer's original specification/information, schemes and diagrams from the construction of the facility could be used as an estimate of quantity and energy content of waste gas/heat produced for rated plant capacity/per unit of product produced. • On site checks by DOE prior to project implementation can check that no equipment for waste gas recovery and use has been installed prior to the implementation of the CDM project activity.	
For Type-1 project activities, in cases where waste energy recovery activities were already implemented in other streams of WECM prior to the implementation of the CDM project activity, the following should be demonstrated: • That there is no decrease in energy generated from the waste energy recovered previous to the implementation of the CDM project activity; or • In the case where there is a decrease in energy generation from previously recovered waste energy, it can be demonstrated that the decrease is due to a decrease in generation of waste energy on account of the factors not related to the project activity; The conditions shall be confirmed by the verifying DOE for each issuance period.	The project activity is a Greenfield activity involves installation of waste heat recovery system from the hot stove of the blast furnace. Hence this scenario is not applicable.

As apparent from the above table, the project activity satisfies all the applicability conditions as specified in the methodology ACM0012 (version 3.2), and hence the methodology is applicable for the project activity.

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

The geographical extent project boundary shall include the following:

- The industrial facility where waste energy is generated, including the part of the industrial facility where waste gas was utilized for generation of captive electricity prior to implementation of the project activity
- The facility where process heat in the elemental process/ steam/ electricity/ mechanical energy is generated (generator of process heat/ steam/ electricity/ mechanical energy). Equipment providing auxiliary heat to the waste energy recovery process shall be included within the project boundary; and
- The facility (ies) where the process heat in the elemental process/ steam/ electricity/ mechanical energy is used (the recipient plant(s)) and / or grid where electricity is exported, if applicable.



Overview of emission sources included in or excluded from the project boundary is provided in the following table:

Table 1: Summary of gases and sources included in the project boundary and justification explanation where gases and sources are not included.

	Source	Gas	Included	Justification/Explanation
Baseline	Fossil fuel consumption in furnace and burner for thermal energy	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 emission	Supplemental electricity consumption.	CO_2	Excluded	There is no supplemental electricity consumption in the project acitivity.
		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:

According to the methodology ACM0012, Version 3.2, the baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s).

Step 1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations:

Realistic and credible alternatives should be determined for:
• Waste energy use in the absence of the project activity; and
• Heat generation in the absence of the project activity; and

This section involves the identification of baseline scenario that would have been occurred in the absence of project activity. In IISCO Steel Plant, Burnpur the waste heat from the hot stoves i.e flue gas is used for preheating the BF gas and combustion air. Hence in this project activity the alternative scenarios are considered for waste energy use and heat generation in the absence of project activity.

Baseline scenario for waste gas utilization	Description	Comments
W1	WECM is directly vented to atmosphere without incineration or waste heat is released to the atmosphere or waste pressure energy is not utilized;	In the absence of the project activity, waste heat would have been released to the atmosphere. Hence this can be considered to be a likely baseline scenario.
W2	WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized;	In the absence of the project activity, waste heat would have been released to the atmosphere. Hence this can be considered to be a likely baseline scenario.
W3	Waste energy is sold as an energy source	This scenario is not applicable as there are no users of heat located near to the project location and there is no heat supply network around the project site. Therefore, transport of heat over long distances is not economical and feasible.
W4	Waste energy is used for meeting energy demand	Recovering the waste heat and using it for energy demand faces investment as well as technological barrier (Please refer section B.5 of the PDD). Hence it cannot be considered as baseline scenario.
W5	A portion of the waste gas	This scenario is not applicable

	produced at the facility is captured and used for captive electricity generation, while the rest of the waste gas produced at the facility is vented/flared;	since the project activity does not involve utilization of waste gas.
W6	All the waste gas produced at the industrial facility is captured and used for export electricity generation.	This scenario is not applicable since the project activity does not involve utilization of waste gas.

Baseline scenario for heat generation	Description	Comments
H1	Proposed project activity not undertaken as a CDM project activity	Waste heat based energy generation is in compliance with local laws and regulations. But the project will face barriers for its implementation. So this scenario cannot be considered as a suitable baseline scenario.
H2	On-site or off-site existing/new fossil fuel fired cogeneration plant	The project activity does not involve cogeneration and hence not a baseline scenario
H3	On-site or off-site existing/new renewable energy based cogeneration plant	The project activity does not involve cogeneration and hence not a baseline scenario
H4	An existing or new fossil fuel based boilers	Fossil fuel fired heat generation is an economically attractive option. So this scenario can be considered as a most plausible baseline scenario.
H5	An existing or new renewable energy or other waste energy based boilers	. There is no Integrated steel industry in India which uses Renewable energy sources such as biomass for their process heat requirement owing to the nature of the industry which requires uninterrupted and enormous energy supply. Also the CO_2 baseline database published by the Govt. Of India does not consider Wind, Biomass and Solar based plants under baseload category. Further a separate write up on lack of renewable energy in the project location is available as Appendix B to the PDD

		Other waste energy based boilers were also not available at site in the pre project scenario as this is a Greenfield project. Hence this option cannot be considered as a plausible baseline scenario.
H6	Any other source such as district heat	There is no district heat facility is available in the project location.
H7	Other heat generation technologies (e.g. heat pumps or solar energy)	Heat generation from heat pump and solar energy faces investment as well as technological barriers. Hence it cannot be considered as baseline scenario.
H8	Steam / process heat generation using waste heat, but with lower efficiency.	Waste heat based energy generation is in compliance with local laws and regulations. There is no steam/process heat generation in the existing scenario which can be used as a source to supply the heat energy. Hence steam /process heat generation using waste heat with lower efficiency is not applicable. Furthermore, in the project scenario, the IRR with 10% lower efficiency will further bring down the Project IRR from 9.75% to 8.06%. As per EB-61 clarification on ACM0012 version 3.2, certificate from the manufacturer of the blast furnace (POSCO) confirms that the only alternative for the project activity is to vent the waste heat. (copy submitted to DoE). So this scenario cannot be considered as a suitable baseline scenario
H9	Cogeneration with waste energy, but with lower efficiency.	The project activity does not involve cogeneration and hence not a baseline scenario

Alternative combination analysis:

Heat / Waste heat	**W1 (W2)** Waste heat is released to the	**W4** Waste energy is used for meeting

	atmosphere	energy demand
H1- Proposed project activity not undertaken as a CDM project activity	This combination is not possible because there is no heat generation if the waste heat is released to the atmosphere.	To implement the proposed project activity without CDM benefits. This is a possible combination.
H4- An existing or new fossil fuel based boilers	Waste heat is released to the atmosphere and the heat demand would have met from fossil fuel based boilers. This is a possible combination.	This combination is not possible since the proposed project activity is aimed to reduce the emission that would have happened from fossil fuel based systems.

Therefore, there are two combination couldn't be excluded among the alternatives in waste heat utilization and heat supply, i.e.

Combination 1: To implement the proposed project activity without CDM benefits
Combination 2: Waste heat is released to the atmosphere and the heat demand would have met from fossil fuel based boilers.

Step 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable:
There is no national or local regulation on mandatory uses of waste heat recovery in such cases. However, the National Government has been very proactive towards the utilization of energy efficiency technologies. Some of the Policies which support/promote energy efficiency as well as Climate change mitigation initiatives are listed below:

- National Action Plan on Climate Change.
- Energy Conservation Act. 2007.
- Electricity from Renewables.
- Enhancing Energy Efficiency for Power Plants.
- Introduction of Lebelling programmes for appliances.
- Energy Conservation Building codes.
- Accelerated Introduction of Clean Energy Technologies through the CDM

In the absence of the proposed project activity excess BF gas would have been consumed for the same output (Hot blast). Since BF gas has a higher emission factor **(260 tCO_2e/TJ),** as a conservative approach equivalent amount of coal **(94.6 tCO_2e/TJ)** is used as a baseline fuel. There are no regulations / national / sectoral policies that prevent the use of BF gas / coal for energy generation in India.

<u>Surplus Coal availability:</u>
As per the World Energy Outlook 2007, although the coal deposits are widely distributed, 67% of the World's recoverable reserves are located in four countries , the United States, Russia , China and India. Indian Coal reserve is 10% of the total world coal reserve. World Coal Association in its web site has also mentioned that the biggest coal reserve in the World is located in these 4 countries.
Refer: http://tonto.eia.doe.gov/ftproot/forecasting/0484(2007).pdf)
Refer: http://www.worldcoal.org/coal/where-is-coal-found/

<u>Fast facts:</u>
- India is the **third highest** producer of coal in the world.
- Approximately 93% of Indian Coal is non coking grade, where as 7% is coking Coal.

- Coal accounts for about **67%** of total energy consumption. consumption in India.

- India has the fourth largest coal reserves **(197 billion tons)** in the world.

- India's coal reserves form around **seven** percent of world's total and are fourth largest in the world.

- Coal reserves will last India another **100** years.

Source : http://www.diehardindian.com/infra/coal.htm
Hence India has abundance of coal and will be having surplus coal availability in the future.

Step 3: step2 and/or step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" in section B.5 *shall be used to identify the most plausible baseline scenarios by eliminating non-feasible options (E.g. alternatives where barriers are prohibitive or which are clearly economically unattractive).*

As the investment analysis described in section B.5 below, the Internal Rate of Return (IRR) for the project activity without CDM consideration is only 9.75% (Pre tax), which is lower than the benchmark IRR(RBI PLR) of 12.75%. Therefore, the proposed project activity is not economically attractive if the project is undertaken without CDM benefits. Therefore the proposed project activity without CDM is economically unattractive. Therefore, the scenario H1 and W4 are not credible and realistic, shall be excluded.

Step 4: If more than one credible and plausible alternative scenario remain, the alternative with the lowest baseline emissions shall be considered as the most likely baseline scenario:
During the preparation of PDD it is identified that the user and the generator of waste energy is same. So, according to the methodology ACM0012 only one option is considered for baseline scenario which is most plausible baseline scenario mentioned in table below:

Project Scenario	**Baseline options**		**Description of situation**
	Waste gas	**Heat**	
1	W1 or W2	H4	The waste heat will be released in to the atmosphere along with the flue gas without any utilization and the heat demand will be met by burning of fossil fuels

As per the above analysis, only credible baseline scenario for the proposed project activity is W1(W2) and H4 i.e., "The waste heat will be released in to the atmosphere along with the flue gas without any utilization and the heat demand will be met by burning of fossil fuels".
As per EB-61 clarification on ACM0012 version 3.2, certificate from the manufacturer (POSCO) dated 08/08/2011 mentions that the only alternative for the project activity is to vent the waste energy to the atmosphere. Hence an investment comparison analysis is done as per EB-61 clarification on ACM0012; version 3.2 to show that the project activity is not the baseline scenario is as follows:

Investment comparison Analysis

Heat generation from waste heat recovery system			Heat generation from fossil fuel (coal)		
Particulars	Value	Unit	Particulars	Value	Unit
Heat Extraction /Heat saved through Heat Exchanger	683.15	TJ/year	Heat derived from fossil fuel based boiler	683.15	TJ/year
Block cost of heat exchanger	2271.5	Rs. Lakh	Cost of boiler	0	Rs. Lakh
Tax	636	Rs. Lakh	Tax	0	Rs. Lakh
Total Project Cost	2907.5	Rs. Lakh	Calorific Value of Coal	4125	Kcal/kg
Expenses During Construction @ 17%	494.275	Rs. Lakh	Expenses During Construction @ 17%	0	Rs.Lakhs
Contingency @ 3%	87.225	Rs. Lakh	Contingency @3%	0	Rs.Lakhs
Total Cash Outflow	3489	Rs. Lakh	Equivalent Heat in Kcal/yr	1.63136E+11	KCal/year
Cost of Funds on total cost employed for cash outflow taken @12.75 % for 20 years on Rs. 4444.42 (Rs. 3489 +Rs.956.42)	8977.51	Rs. Lakh	Cost of Coal	1.49	Rs/Kg
Additional manpower cost	1317.6	Rs. Lakh	Coal requirement	39548174.55	Kgs/Year
			Annual cost	589.2678007	Rs. In Lakhs
Total cash outflow for 20 years	**13784.11**	**Rs. Lakh**	**Total cash outflow for 20 yrs.**	**11785.35601**	**Lakh Rs.**
Annual Investment	**689.2055**	Rs. Lakh	Annual Investment	**589.2678007**	Rs. Lakh

Above investment comparison analysis shows that the least cost option is to release the waste energy to the atmosphere; hence the baseline.

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):

According to the consolidated baseline methodology ACM0012, the project must demonstrate additionality according to the most recent version (version 5.2.1 of the "*Tool for the demonstration and assessment of additionality.*" The Tool consists of the following steps:

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

Sub-step 1a. Alternatives to the project activity

Alternative 1: Proposed project activity without undertaken as a CDM project activity:
As discussed under step 2. Investment analysis, the Internal Rate of Return (IRR) for the project activity without CDM consideration is only 9.75% (Pre tax), which is lower than the benchmark IRR (RBI PLR) of 12.75%. Therefore, the proposed project activity is not economically attractive if the project is undertaken without CDM benefits.

Alternative 2: Utilization of fossil fuel for meeting the heat demand:
In the absence of the project activity, the waste heat would have released to the atmosphere and excess BF gas (Equivalent coal) would have been used for generating the same output (Hot blast). This alternative does not require any investment and it is an economically attractive option.

Sub-step 1b. Consistency with mandatory laws and regulations
The alternatives identified above are in consistent with the prevailing laws and regulations.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method:
Since the project activity generates revenue from the savings in equivalent coal consumption, the simple costs analysis (Option I) cannot be applied. The alternative to use more BF gas in the hot stoves without waste heat recovery system does not require investment: hence the Investment Comparison Analysis (Option II) is not appropriate. The Benchmark Analysis (Option III) is the right approach to demonstrate that the project is not economically or financially feasible without the sale of CER revenues.

Sub-step 2b: Option III- Benchmark Analysis

Project IRR has been considered as a suitable financial indicator since it is the commonly used approach. RBI Prime Lending rate (RBI PLR[1]) has been considered as a benchmark for this project activity.

The following parameters have been used to calculate the IRR of the project activity,

S.No	Parameters	Unit	Value	Source
1	Total Cost outflow (Including project cost, EDC, & Contingency)	INR Lakhs	3489.00	Calculated
2	Project cost	INR Lakhs	2907.5	Calculated
3	Basic Cost of the waste heat recovery system	INR Lakhs	2271.5	Letter from MECON dated 12/06/2010
4	Tax	INR Lakhs	636	Based on the DPR chapter on Estimated Capital Cost
3	Expenses during construction @ 17% of total project cost	INR Lakhs	494.275	Annex - IV Guidelines for formulation of investment proposal for appraisal
4	Contingency @ 3% of total cost	INR Lakhs	87.225	Annex - III Guidelines for formulation of investment proposal for appraisal
5	Operation & Maintenance cost @ 5 % of total cost	INR Lakhs	145	Certificate from the technology supplier / manufacturer

[1] Based on the prime lending rate from Reserve Bank of India

10	Cost of coal	INR / Kg	1.491	Monthly coal receipts
11	Average calorific value of coal	Kcal /kg	4125	Communication from IISCO Steel Plant
12	Heat exchange rate in BF gas heat exchanger	Gcal / hr	10.235	Calculated based on Manufacturer's specification
13	Heat exchange rate in combustion air heat exchanger	Gcal / hr	9.193	Calculated based on Manufacturer's specification
14	Operating days	Days	350	Detailed Project Report
15	Saving of coal per year	Kgs / year	39562473	Calculated
16	Cost savings per year	INR Lakhs / year	590.2877	Calculated
17	CER per year	CERs/year	64626	Calculated
18	CER price	Euro/CER	10	http://www.carbonpositive.net/viewarticle.aspx?articleID=730
19	Exchange rate	INR/Euro	56.49	Letter from IISCO and x-rates web site for exchange rate

Detail breakup of Operation & Maintenance cost is given in the table below:

Break up of O &M Cost	Rs. (INR)-in Lakhs
Manpower Deployment cost	65.88
Cost of Spares	16.0
Operational Expenditure	5.0
Repair & Maintenance	58 . 14
Total	145.02

Based on the above data, the IRR for the project activity has been calculated without CDM benefits,

	Without CDM	Benchmark
IRR	9.75%	12.75%

Reference of similar projects where the O & M cost hasbeen assumed as 5%:

1. Project 2917 : Waste Heat Recovery Based Power generation at Vision Sponge Iron Private Ltd, West Bengal, India.
 http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1250070971.4/view
2. Project 2504 : Utilization of waste gas heat for power generation. http://cdm.unfccc.int/Projects/DB/RWTUV1239793880.21/view

The reference given above has O & M cost is more than 5%. SAIL has considered O & M cost in most conservative manner and assumed it as 5% of total project cost.

Sub-step 2c: Comparison of financial indicators

Conclusion of the Benchmark Analysis

As per the above table it is clearly evident that the project is financially not viable without the benefits of CER revenues. Hence the project is additional.

Sub-step 2d: Sensitivity Analysis
The purpose of the Sensitivity Analysis is to determine whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.

The guidance requires the robustness of the conclusion to be proved through sensitivity analysis by varying the critical assumption to a reasonable variation (at least 10%).

In the project activity three variables: Quantity of waste heat, operation & maintenance cost, total project cost & Coal cost are considered as the critical assumptions. The results of the sensitivity analysis are shown in the following table:

Sensitivity Analysis					
Factor	**-10%**	**-5%**	**0%**	**+5%**	**+10%**
Quantity of waste heat	8.06%	8.92%	9.75%	10.55%	11.32%
Operation & Maintenance Costs	10.14%	9.94%	9.75%	9.54%	9.34%
Total project cost	11.08%	10.39%	9.75%	9.15%	8.59%
Coal Cost	8.06%	8.92%	9.75%	10.55%	11.32%
Benchmark	12.75%	12.75%	12.75%	12.75%	12.75%

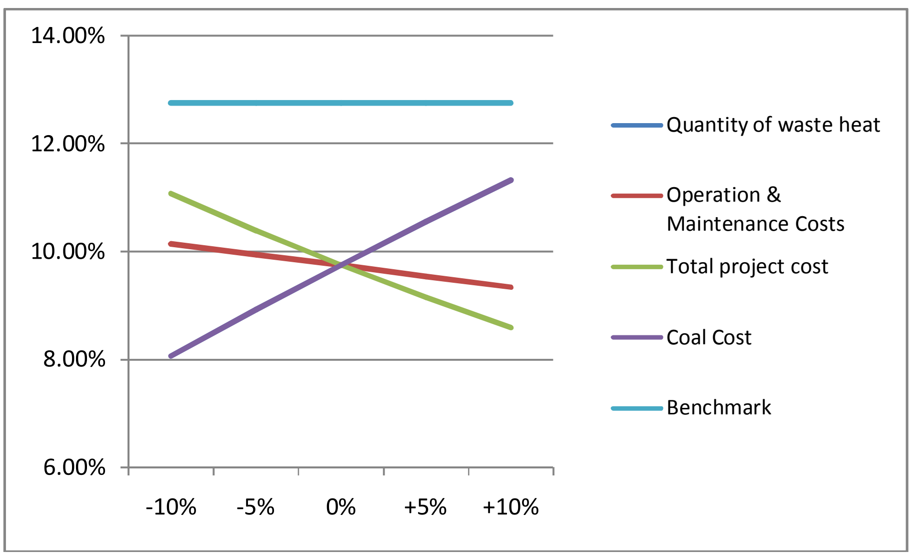


Table below shows the variation required for identified parameters to reach bench mark:

Sensitivity Analysis			
Factor	**Variation**	**IRR**	**Benchmark**
Quantity of waste heat	+20%	12.81%	12.75%
Operation & Maintenance Costs	-80%	12.77%	12.75%
Total project cost	-21%	12.84%	12.75%
Coal Cost	+20%	12.81%	12.75%

The above sensitivity analysis clearly demonstrates that the project is not viable even under more favourable conditions. Therefore the project is not viable without the benefits from the CER revenue. Hence the project is additional.

Step 4: Common Practice Analysis:

The common practice scenario discussed below further substantiates the fact that this project activity faces investment risks as well as technological barriers to implementation and is therefore not a widespread proposition for integrated iron and steel manufacturing sectors under similar socio-economic environment in India

Sub step 4a: Analyze other activities similar to the proposed project activity:

The common practice analysis has been conducted among the Indian Integrated Iron and Steel industry. As per the presentation by Ministry of Steel to the APP Steel task force, there are only four Iron and Steel industry in India (SAIL, TISCO, RINL, and JSW)[2] having the BF-BOF route of steel production. This analysis compares the hot stove waste heat recovery technology penetration among the above mentioned Iron and Steel industries. During May 2007 (Decision making date) only one Iron and Steel industry had implemented the hot stove waste heat recovery system[3]. This is evident from the below table,

Project Proponent	Project Name	Public source	CDM Status
TISCO	Installation of waste heat recovery system at the hot stoves of G Blast furnace	http://www.nedo.go.jp/english/activities/portal/gaiyou/p93050/p93050.html	No
RINL	No Installation	Email Communication from RINL dated 25/06/2010	NA
JSW	No Installation	Email Communication from JSW dated 25/06/2010	NA

Letters from RINL and JSW for common practice analysis are also provided to DoE.

Sub step 4b: Discuss any similar options that are occurring: As discussed in step 4a, only one project activity (TATA Steel) had been installed without CDM consideration. Project activity at TATA steel had been funded and implemented as a part of the model project by NEDO, Japan under the Kyoto mechanism[4]. Hence there is no project activity installed during May 2007 without CDM / Funding. Therefore this project activity is not a common practice in Indian Integrated Iron & Steel sector and therefore it is additional.Chronology of events:

The following table gives the chronology of events related to the project activity.

S.No	Events	Date
1.	Detailed project report preparation awarded to MECON	11/01/2006
2.	Detailed Project report submission by MECON	10/11/2006
3.	Board resolution to undertake the project activity as CDM project activity.	26/05/2007
4.	Public tender for CDM consultancy services	02/08/2007

[2] Please refer presentation from Ministry of Steel to APP Steel Task Force dated 26/11/2008

[3] Please refer E-Mail Communication from RINL & JSW dated 25/06/2010

[4] http://www.nedo.go.jp/english/activities/portal/gaiyou/p93050/p93050.html

5.	Contract signed between M/s Steel Authority of India Limited and Consortium of M/s POSCO E&C Limited and M/s. NCC for the construction of the project activity.	16/10/2007
6.	Work order between SAIL and CDM consultants for CDM services.	19/11/2007
7.	Invitation sent to stakeholders for Stakeholder meeting.	31/01/2008
8.	Stakeholder meeting conducted in IISCO Steel Plant, SAIL.	04/02/2008
9.	Submission of PDD to Ministry of Environment & Forests, Government of India for HCA.	18/06/2008
10.	Grant of Consent to Establish by the West Bengal State Pollution Control Board.	30/06/2008
11.	Host country approval received for the project activity.	16/01/2009
12.	Appointment of the validators.	12/01/2009
13.	Web hosted for Global Stake holder Consultation Period.	12/03/2009– 10/04/2009
14.	Validation site visit.	27/05/2009

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The baseline emissions for the year *y* shall be determined as follows

$$BE_y = BE_{En,y} + BE_{flst,y}$$

Where:

BE_y = The total baseline emissions during the year *y* in tons of CO_2

$BE_{En,y}$ = The baseline emissions from energy generated by project activity during the year *y* in tons of CO_2

$BE_{flst,y}$ = Baseline emissions from steam generation, if any, using fossil fuel that would have been used for flaring the waste gas in absence of the project activity (tCO2e per year). This is relevant for those project activities where in the baseline steam is used to flare the waste gas

In this project activity the waste heat recovery device has been used to preheat the combustion air and BF gas using the waste heat of hot flue gases from the hot stove. The baseline emission for the project activity has been developed as per Baseline emission for scenario 1of methodology ACM 0012 version 3.2

The calculation of baseline emissions ($BE_{En,y}$) depends on which of the following baseline scenarios have been identified:

Since the identified baseline scenario is only heat production and hence the baseline emission is calculated using the following equation.

Baseline emissions from thermal energy ($BE_{ther,y}$):

$$BE_{ther,y} = f_{cap} * f_{wcm} * \sum_{j} \sum_{i} (HG_{j,y}) + (MG_{i,j,y,tur} / \eta_{mech,tur}) * EF_{heat,j,y}$$

Where:

$BE_{Ther,y}$ = Baseline emissions from thermal energy (as steam) during the year *y* in tons of CO_2

$HG_{j,y}$ = Net quantity of heat supplied to the recipient plant j by the project activity during the year *y* in TJ (In case of steam this is expressed as difference of energy content between the steam supplied to the recipient plant and the condensate returned by the recipient plant(s) to element process of cogeneration plant. In case of hot water/oil this is expressed as difference in energy content between the hot water/oil supplied to and returned by the recipient plant(s) to element process of cogeneration plant).

f_{wcm} = Fraction of total heat generated by the project activity electricity using waste energy. This fraction is 1 if the heat generation is purely from use of waste energy.

f_{cap} = Energy that would have been produced in project year *y* using waste energy generated in base year expressed as a fraction of total energy produced using waste source in year *y*. The ratio is 1 if the waste energy generated in project year *y* is same or less than that generated in base year.

$MG_{i,j,y,tur}$ = Mechanical energy generated and supplied to the recipient j, which in the absence of the project activity would receive power from a steam turbine *i,* driven by steam generated in a fossil fuel boiler. Refer monitoring table for the guidance to estimate this parameter.

$\eta_{mech, tur}$ = The efficiency of the baseline equipment (steam turbine) that would provide mechanical power in the absence of the project activity

$EF_{heat,j,y}$ = The CO_2 emission factor of the element process supplying heat that would have supplied the recipient plant j in absence of the project activity, expressed in tCO_2/TJ and calculated as follows:

$$\mathbf{EF}_{\mathbf{heat,j,y}} = \sum_i WSi,j \frac{EFCO2,i,j}{\eta EP,i,j}$$

Where:

$EF_{CO2,i,j}$ = The CO_2 emission factor per unit of energy of the baseline fuel used in ith boiler used by recipient j, in tCO_2/TJ, in absence of the project activity

$\eta_{EP,i,j}$ = Efficiency of the ith element process that would have been supplied heat to jth recipient in the absence of the project activity

$ws_{i,j}$ = Fraction of total heat that is used by the recipient j in the project that in absence of the project activity would have been supplied by the ith boiler

Baseline emissions from use of fossil fuel for flaring of waste gas in absence of the project activity ($BE_{flst,y}$)

Since it is a new project activity, there is no plant specific historic data available to estimate the various parameters then the emissions from this source is ignored.

$BE_{flst,y} = 0$

Calculation of the energy generated (electricity and/or steam) in units supplied by WECM and other Fuels

The fraction of total heat generated by the project activity electricity using waste energy ($f_{wcm} = 1$) if the heat generation is purely from use of waste energy.

Capping of baseline emissions

As an introduction to the element of conservativeness, this methodology requires that baseline emissions should be capped irrespective of planned/unplanned or actual increase in output of plant, change in operational parameters and practices, change in fuel type and quantity resulting in an increase in generation of waste energy. In case of planned expansion a separate CDM project should be registered for additional capacity. The cap can be estimated using the three Methods described below. Project proponents shall use Method-1 to estimate the cap if data is available. In case of project activities implemented in a new facility, or in facilities where three-year data on production is unavailable, Method-2 shall be used. In case the project proponents demonstrate technical limitations in direct monitoring of waste heat / pressure of waste energy carrying medium (WECM), then Method-3 is used.

Method - 2:

The manufacturer's data for the industrial facility shall be used to estimate the amount of waste energy the industrial facility generates per unit of product generated by the process that generates waste energy (either product of departmental process or product of entire plant, whichever is more justifiable and accurate). In case any modification is carried out by the project proponent or in case the manufacturer's data is not available for an assessment, this should be carried out by independent qualified/certified external process experts such as a chartered engineer on a conservative quantity of waste energy generated by plant per unit of product manufactured by the process generating waste energy. The value arrived based on above sources of data, shall be used to estimate the baseline cap (fcap). The documentation of such assessment shall be verified by the validating DOE. The basis for using the capped value (including manufacturer's design document/letter and the expert's analysis) should be provided to DoE during validation.

Under this method, following equations should be used to estimate f_{cap}.

$$f_{cap} = Q_{WCM,BL} / Q_{WCM,y}$$

$$Q_{WCM,BL} = Q_{BL,product} * q_{WCM,product}$$

Where:

$Q_{WCM,BL}$	= Quantity of waste energy generated prior to the start of the project activity estimated using the above equation (Nm^3)
$Q_{BL,product}$	= Production associated with the relevant waste energy generation as it occurs in the baseline scenario. The minimum of the following two figures should be used: (1) average annual historical production data from start-up, if the plant's operational history is less than three years, of the plant or (2) the most relevant manufacturer's data for normal operating conditions. In case of new facilities or where data is not available the manufacturer's data for normal operating conditions shall be used.
$q_{WCM,product}$	= Amount of waste energy per unit of product generated by the process (that generates waste energy) in the industrial facility.

Project Emissions

Project Emissions include emissions due to (1) combustion of auxiliary fuel to supplement waste gas/heat and (2) electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of energy or other supplementary electricity consumption

$\boldsymbol{PE_y = PE_{AF,y} + PE_{EL,y}}$

Where:

PE_y	= Project emissions due to project activity
$PE_{AF,y}$	= Project activity emissions from on-site consumption of fossil fuels by the cogeneration plant(s), in case they are used as supplementary fuels, due to nonavailability of waste energy to the project activity or due to any other reason
$PE_{EL,y}$,	= Project activity emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption

In cases where the electricity was consumed in gas cleaning equipment in the baseline as well, project emissions due to electricity consumption for gas cleaning can be ignored.

Project emissions due to electricity consumption of gas cleaning equipment or other supplementary electricity consumption Project emissions are calculated by multiplying the CO_2 emission factor for electricity ($EF_{CO2,EL}$) by the total amount of electricity used as a result of the project activity ($EC_{PJ,y}$). The source of electricity may be the grid or a captive power plant. Project emissions from consumption of additional electricity by the project are determined as follows

$PE_{EL,y} = EC_{PJ,y} * EF_{CO2,EL,y}$

Where:

$PE_{EL,y}$	= Project emissions from consumption of electricity in gas cleaning equipment of project activity or other supplementary project electricity consumption (t CO2/yr)
$EC_{PJ,y}$	= Additional electricity consumed in year *y* as a result of the implementation of the project activity (MWh)
$EF_{CO2,EL,y}$	= CO2 emission factor for electricity consumed by the project activity in year y (t CO2/MWh)

Leakage

No leakage is applicable under this methodology.

Emission Reductions

Emission reductions due to the project activity during the year *y* are calculated as follows:

$\boldsymbol{ER_y = BE_y - PE_y}$

Where:

ER_y = Total emissions reductions during the year *y* in tons of CO2

PE_y = Emissions from the project activity during the year *y* in tons of CO2

BE_y = Baseline emissions for the project activity during the year *y* in tons of CO2

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

(Copy this table for each data and parameter)

Data / Parameter:	Q_{WECM}
Data unit:	Nm^3/hr
Description:	Quantity of waste energy carrying medium (flue gas) entering the heat exchanger
Source of data used:	Manufacturer's specification
Value applied:	460000

Justification of the choice of data or description of measurement methods and procedures actually applied :	This data required for estimate the total heat exchanged to BF gas and Combustion air. Data has been taken from the manufacturer's specification.
Any comment:	-

Data / Parameter:	Q $_{BF\ gas}$
Data unit:	Nm^3/hr
Description:	Quantity of BF gas entering the heat exchanger
Source of data used:	Manufacturer's specification
Value applied:	270000
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the manufacturer's specification.
Any comment:	

Data / Parameter:	**Q** $_{Comb\ Air}$
Data unit:	Nm^3/hr
Description:	Quantity of Combustion air entering the heat exchanger
Source of data used:	Manufacturer's specification
Value applied:	240000
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the manufacturer's specification.
Any comment:	-

Data / Parameter:	Temp inlet $_{BF\ gas}$
Data unit:	^oC
Description:	Temperature inlet of BF gas to the heat exchanger
Source of data used:	Manufacturer's specification
Value applied:	35
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the manufacturer's specification.
Any comment:	-

Data / Parameter:	Temp outlet $_{BF\ gas}$
Data unit:	^oC
Description:	Temperature outlet of BF gas from the heat exchanger

Source of data used:	Manufacturer's specification
Value applied:	180
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the manufacturer's specification.
Any comment:	

Data / Parameter:	Temp inlet $_{\text{Combustion air}}$
Data unit:	^{o}C
Description:	Temperature inlet of combustion air to the heat exchanger
Source of data used:	Manufacturer's specification
Value applied:	25
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the manufacturer's specification.
Any comment:	

Data / Parameter:	Temp outlet $_{\text{Combustion air}}$
Data unit:	^{o}C
Description:	Temperature outlet of combustion air from the heat exchanger
Source of data used:	Manufacturer's specification
Value applied:	180
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the manufacturer's specification.
Any comment:	

Data / Parameter:	Cp $_{\text{BF gas}}$
Data unit:	KJ/kg.^{0}C
Description:	Specific heat of BF gas
Source of data used:	http://www.engineeringtoolbox.com/spesific-heat-capacity-gases-d_159.html
Value applied:	1.03
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the above mentioned link.
Any comment:	

Data / Parameter:	Cp $_{\text{Combustion air}}$
Data unit:	KJ/kg.^{0}C
Description:	Specific heat of Combustion air

Source of data used:	http://www.engineeringtoolbox.com/spesific-heat-capacity-gases-d_159.html
Value applied:	1.01
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the above mentioned link.
Any comment:	

Data / Parameter:	$\rho_{\text{BF gas}}$
Data unit:	Kg/m^3
Description:	Density of BF gas
Source of data used:	http://www.engineeringtoolbox.com/gas-density-d_158.html
Value applied:	1.25
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the above mentioned link.
Any comment:	-

Data / Parameter:	$\rho_{\text{Combustion air}}$
Data unit:	Kg/m^3
Description:	Density of Combustion air
Source of data used:	http://www.engineeringtoolbox.com/gas-density-d_158.html
Value applied:	1.205
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to estimate the recovered waste heat from the flue gas (WECM). Data has been taken from the above mentioned link.
Any comment:	-

Data / Parameter:	$Q_{\text{BL, product}}$
Data unit:	Tonnes / day
Description:	Quantity of Hot metal production per day
Source of data used:	Page 15 of Detailed project report of Blast furnace complex
Value applied:	7700
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to calculate the capping factor.
Any comment:	-

Data / Parameter:	$q_{\text{wcm, product}}$
Data unit:	Nm^3/ tonne
Description:	Quantity of waste energy per unit of product generated by the process

Source of data used:	Calculated based on Detailed project report of blast furnace complex and manufacturer's specification
Value applied:	1433.77
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to calculate the capping factor.
Any comment:	-

Data / Parameter:	EF_{coal}
Data unit:	tCO_2/TJ
Description:	Emission factor of coal
Source of data used:	IPCC green house gas inventories 2006
Value applied:	94.6
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to calculate the ex ante baseline emission
Any comment:	-

Data / Parameter:	η_{BL}
Data unit:	%
Description:	Efficiency of baseline system
Source of data used:	
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to calculate the ex ante baseline emission. Maximum efficiency of 100% has been considered as a conservative approach.
Any comment:	-

Data / Parameter:	OPR_{days}
Data unit:	days
Description:	Number of operating days of blast furnace
Source of data used:	Technical specification of blast furnace
Value applied:	350
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is required to calculate the ex ante baseline emission.
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

Baseline emission (BE):

The baseline emissions for the year *y* shall be determined as follows

$$BE_{ther,y} = f_{cap} * f_{wcm} * \sum_{j} \sum_{i} (HG_{j,y}) + (MG_{i,j,y,tur} / \eta_{mech,tur}) * EF_{heat,j,y}$$

Where

$$EF_{heat,j,y} = \sum_{i} WSi,j \frac{EFCO2,i,j}{\eta EP,i,j}$$

$EF_{CO2,j,y}$ = 94.6 tCO_2/TJ

$EF_{heat,j,y}$ = 94.6/1 = 94.6

$$HG_{j,y} = ((m_{BF\ gas} * Cp_{BF\ gas} * \Delta T_{BF\ gas} * \rho_{BF\ gas}) + (m_{CA} * Cp_{CA} * \Delta T_{CA} * \rho_{CA})) * PLF$$

Where,

$m_{BF\ gas}$ = Mass of BF gas entering heat exchanger, Nm^3 / year

$Cp_{BF\ gas}$ = Specific heat of BF gas, KJ/kg.^{0}C

$\Delta T_{BF\ gas}$ = Temperature difference of BF gas entering and leaving the heat exchanger

$\rho_{BF\ gas}$ = Density of BF gas, Kg/m^3

m_{CA} = Mass of Combustion air entering heat exchanger, Nm^3 / year

Cp_{CA} = Specific heat of Combustion air, KJ/kg.^{0}C

ΔT_{CA} = Temperature difference of Combustion air entering and leaving the heat exchanger

ρ_{CA} = Density of Combustion air, Kg/m^3

PLF = Plant load factor of heat exchanger

Therefore,

$HG_{j,y}$ =((2268*10^6* 1.03 * 145 * 1.25) + (2016*10^6* 1.01 * 155 * 1.205)) * 85%
= 683.15 TJ /year

Fraction of total energy produced by the project activity is purely from the waste energy, hence

f_{wcm} = 1

f_{cap} = that would have been produced in project year y using waste gas/heat generated in base year expressed as a fraction of total energy produced using waste gas in year y. As per method 2 of ACM 0012 version 3.2 following equations has been used to estimate f_{cap}.

f_{cap} = $Q_{WCM,BL}$ / $Q_{WCM,y}$

$Q_{WCM,BL}$ = $Q_{BL,product}$ * $q_{wcm,product}$
= 7700 tonnes of hot metal production per day * 1433.77 Nm^3 of WCM (Flue gas) per tonne of hot metal production
= 11040000 Nm^3 / day

Therefore,

f_{cap} = 11040000 / 11040000
= 1

Baseline emissions from thermal energy during the year *y* in tons of CO_2

$BE_{ther,y}$ **= 1* 1* 683.15 * 94.6**
= 64,626 tCO_2e/ year

Project emission (PE):

There is no project emission in this project activity.

$PE_{EL,y}$ = 0 t CO_2/year

Leakage (L):
No leakage is applicable under this methodology. Therefore,

L = 0

Emission Reductions(ER):
Emission reductions due to the project activity during the year *y* are calculated as follows:

ERy = BEy - PE – L
= 64,626 - 0

= 64,626 tCO_2e/ year

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions(tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2011	0	64,626	0	64,626
2012	0	64,626	0	64,626
2013	0	64,626	0	64,626
2014	0	64,626	0	64,626
2015	0	64,626	0	64,626
2016	0	64,626	0	64,626
2017	0	64,626	0	64,626
Total (tonnes of CO_2e)	0	452,385	0	452,385

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

As per the monitoring methodology ACM 0012 version 3.2, all data collected as part of monitoring plan will be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data will be monitored if not indicated otherwise in the comments in the tables below. The following data shall be monitored.

B.7.1 Data and parameters monitored:

Data / Parameter:	**$Q_{WCM,y}$**
Data unit:	Nm3/hr
Description:	Quantity of Waste energy carrying medium (flue gas) used for preheating during

	year y (Nm3/hr)
Source of data to be used:	IISCO Steel plant log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	460000
Description of measurement methods and procedures to be applied:	Please refer Annex 4
QA/QC procedures to be applied:	Please refer B.7.2 & Annex 4
Any comment:	

Data / Parameter:	**$Q_{BF\ gas,\ y}$**
Data unit:	Nm3/hr
Description:	Quantity of BF gas heated during year y (Nm3/hr)
Source of data to be used:	IISCO Steel Plant log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	270000
Description of measurement methods and procedures to be applied:	Please refer Annex 4
QA/QC procedures to be applied:	Please refer B.7.2 & Annex 4
Any comment:	

Data / Parameter:	**$Q_{Combustion\ air,\ y}$**
Data unit:	Nm3/hr
Description:	Quantity of combustion air heated during year y (Nm3/hr)
Source of data to be used:	IISCO Steel Plant log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	240000
Description of measurement methods and procedures to be applied:	Please refer Annex 4
QA/QC procedures to be applied:	Please refer B.7.2 & Annex 4
Any comment:	

Data / Parameter:	**Temp inlet $_{BF\ gas}$**
Data unit:	^oC
Description:	Temperature inlet of BF gas entering the heat exchanger
Source of data to be used:	IISCO Steel Plant log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	35
Description of measurement methods and procedures to be applied:	Please refer Annex 4
QA/QC procedures to be applied:	Please refer B.7.2 & Annex 4
Any comment:	-

Data / Parameter:	**Temp outlet $_{BF\ gas}$**
Data unit:	^oC
Description:	Temperature outlet of BF gas leaving the heat exchanger
Source of data to be used:	IISCO Steel Plant log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	180
Description of measurement methods and procedures to be applied:	Please refer Annex 4
QA/QC procedures to be applied:	Please refer B.7.2 & Annex 4
Any comment:	-

Data / Parameter:	**Temp inlet $_{CA}$**
Data unit:	^oC
Description:	Temperature inlet of Combustion air entering the heat exchanger
Source of data to be used:	IISCO Steel Plant log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	25
Description of measurement methods and procedures to be applied:	Please refer Annex 4
QA/QC procedures to be applied:	Please refer B.7.2 & Annex 4

Any comment:	-

Data / Parameter:	**Temp outlet $_{CA}$**
Data unit:	^oC
Description:	Temperature outlet of Combustion air leaving the heat exchanger
Source of data to be used:	IISCO Steel Plant log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	180
Description of measurement methods and procedures to be applied:	Please refer Annex 4
QA/QC procedures to be applied:	Please refer B.7.2 & Annex 4
Any comment:	-

Data / Parameter:	**Q $_{Hot\ metal}$**
Data unit:	Tonnes /day
Description:	Quantity of Hot metal production per day
Source of data to be used:	IISCO Steel Plant log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	7700
Description of measurement methods and procedures to be applied:	Please refer Annex 4
QA/QC procedures to be applied:	Please refer B.7.2 & Annex 4
Any comment:	-

Data / Parameter:	**OPR $_{days}$**
Data unit:	Days
Description:	Number of Operating days
Source of data to be used:	IISCO Steel Plant Log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	350
Description of measurement methods	-

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

Data / Parameter:	$EF_{CO2,Coal.}$
Data unit:	Tonnes CO_2/TJ
Description:	CO_2 emission factor of Coal.
Source of data:	IPCC green house gas inventories 2006. The source of data will be the following, in order of preference: project specific data, country specific data or IPCC default values. As per guidance from the Board, IPCC default values will be used only when country or project specific data are not available or difficult to obtain.
Measurement Procedure:	
Monitoring frequency	Yearly
QA/QC procedures to be applied.	No QA/QC necessary for this data item.
Any comment:	IPCC guidelines/Good practice guidance provide for default values where local data is not available.

B.7.2. Description of the monitoring plan:

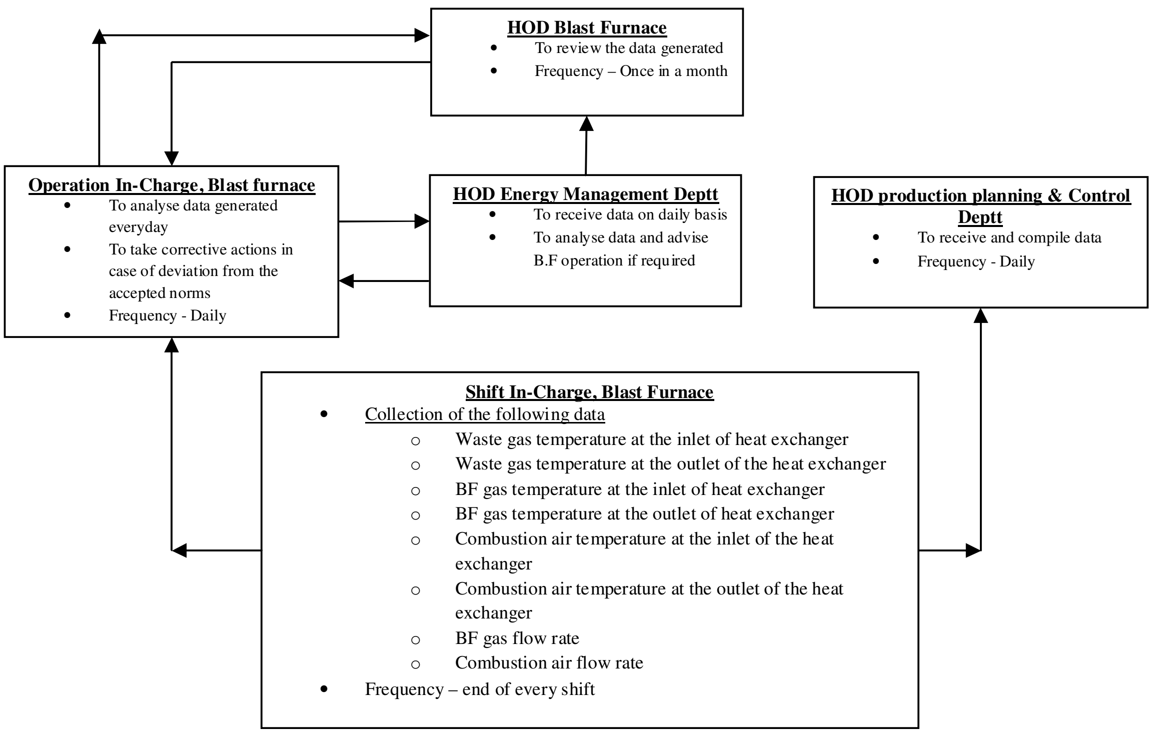
As per the monitoring methodology ACM 0012 Version 3.2, all data collected as part of monitoring plan will be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data will be monitored.

IISCO has developed a procedure to monitor the amount of heat generated in the project activity and hence the emission reduction. The monitoring system will also bring fort operational limitations in the system for the efficient operation.

The split type heat exchangers and its accessories will be monitored for the proposed waste heat recovery project. For safe and efficient operation of the heat exchanger, adequate instruments will be used to control and monitor the various operating parameters of the waste heat recovery device. IISCO will employ the state of the art monitoring and control equipment that will measure, record, report, and monitor and control various key parameters like temperature, quantity of fume generated and the heat generation in the proposed waste heat recovery project.

For monitoring and advisory control of various energy parameters there is a separate team of instrumentation and control working group who looks after the monitoring of the heat exchanger. The parameters will be monitored by the different monitoring instruments in the project activity and the data has archived electronically in the control room.

Monitoring Roles & Responsibilities



The instrumentation system comprises of microprocessor-based instruments of reputed make with the best accuracy available. All instruments are calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time. The calibration frequency too is a part of the monitoring system.

The instruments used for the monitoring, frequency of monitoring, accuracy level of instruments and calibrations procedure for the project activity is enclosed in Annex 4 Monitoring information.

Training of monitoring personnel:
Regular training of monitoring personnel will be given to ensure efficient operation and 100% data collection.

Reporting of Data:
The recording of data (total heat generated, temperature and quantity of fume gas) will be collected in the control room through a microprocessor. The shift in-charge will note down the monitored data in the plant log book on daily basis and report it daily and monthly based on the recorded data.

Verification of monitored data:
The readings will be recorded directly in the central control room on a daily basis. Over and above, the Internal Audit, conducted by IISCO management will ensure the compliance of the monitoring system as described in the 'Monitoring Plan'. Once uncertainties like inconsistency/discrepancy of data/parameters has been found by the internal audit team, immediate action will be taken to correct the uncertainties. During this period the monitored parameters will not be used for CER estimation as a conservative approach.

Emergency Preparedness:

Whenever there is a fault in monitoring equipment, it shall be replaced immediately with calibrated equipment, the energy generated during the period of erroneous measurement and replacement of the fault equipment will not be accounted for CER estimation as a conservative consideration.

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: 15/04/2008

Name & Contact Details of the responsible entity:

Organization:	Asia Carbon Emission Management India Pvt. Ltd.
Street/P.O.Box:	D 101, Brindawan Garden, Plot No.- 10, Sector-12, Dwarka
City:	New Delhi
State/Region:	Delhi
Postfix/ZIP:	110075.
Country:	India
Telephone:	+91 11 45053317-19.
FAX:	+ 91 11 45053318.
URL:	http://www.asiacarbon.com
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Ajmera
First Name:	Anik
Mobile:	+63917882572.
Direct tel:	
Personal E-Mail:	anik@asiacarbon.com

The above entity is not a project participant.

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:

16/10/2007 (Technology supplier contract signing date)

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

20 years and 0 months

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:

The start date of the first crediting period is 01- 03-2011 or a date not earlier than the date of registration of the large scale project activity

C.2.1.2. Length of the first crediting period:

7 Years and 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

C.2.2.2. Length:

SECTION D. Environmental impacts

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

The Ministry of Environment and Forests (MoEF), Government of India made notification on September 14, 2006[5] regarding the requirement of Environment Impact Assessment (EIA) studies for a range of infrastructure projects. The notification states that any project developer in India needs to file an application to the Ministry of Environment and Forests (including a public hearing and an EIA) in the event that the proposed industry or project is identified in a predefined list. Thirty-eight categories of activities are required to undertake an Environment Impact Assessment (EIA). However, the present project activity is not included in this list and is therefore exempted from conducting an EIA.

Although Environmental Impacts hasbeen carried out in and around the project site. There are no negative impacts on Environment from the Project activity.
A synopsis on effect of project activity is given below.
The study area has been taken as 10km radius around the project site. The baseline environmental data were generated during January 2006 to March 2006 (winter season) for meteorology, air quality, water quality, noise levels and soil characteristics, by setting up a number of monitoring stations. Further, existing ecological and socio-economic features were also studied and the performances of the existing plant with respect to different emissions were also monitored. The collected data were analysed for identifying, predicting and evaluating environmental impacts.

Water Environment
Five surface water and four ground water samples were collected and analysed**.** All the parameters in different surface waters were within the CPCB norms.
Results of ground water analysis were compared with IS: 10500 (IS: 10500; 1991, amendment no.1, 1993 - norms for drinking water) and all the parameters were within the desirable and permissible norms.
So, there is no negative impact on water Environment due to project activity.

Ambient Air
Ten AAQ monitoring stations were monitored. The results of SPM at all the stations were below the norms for industrial area.The results of SO2, NOx & CO at all the stations were within the respective norm for residential and industrial area.
Lead in SPM at different AAQ locations ranged from a minimum of 0.040ug/m3 in Chitra Cinema (A5) to a maximum of 0.094 ug/m3 at Kuilapur (A9). However, the values were within CPCB norm (1.5ug/m3) at all the AAQ locations. Benzo- (a)-Pyriene (BaP) was monitored in ambient air and was found to be below the CPCB Norm. The dust fall values were minimum 0.435 g/m2/day at A1 and maximum 0.641 g/m2/day at A8. All the values were below the German T.A Luft norm (0.65 g/m2/day).
So, there is no negative impacts on Air quality due to project activity.

Soil
Five samples of topsoil were collected and were analysed . The analysis results indicates that soils are more or less in the region of neutral pH. Aavailability of Nitrogen & Phosphorus was low to high in all the samples . Potassium was low to high. Organic carbon content is low to medium samples. Overall the soil in
the area is good for plant growth and there is no impacts on soil quality due to project activity.

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[5] [illegible]

Ambient Noise

The noise monitoring were done at six locations. The values at all stations were below the respective statutory norms as applicable and there is no negative impacts due to the project activity.

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:

N.A

SECTION E. Stakeholders' comments

>>

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

A local stakeholder consultation meeting was organised on 04th of February, 2008 at the plant premises. Invitations were sent on 31st January 2008 to the following categories of stakeholders to attend the meeting to brief them on the environmental and socio-economic benefits accrued due implementation of the project activity:

- IISCO Steel Plant Employees representative
- Representatives from Asansol Municipal Corporation
- Representatives from Trade units
- Representatives from Women's Voluntary Services
- Representatives from Animal Welfare
- Representatives from Mahila Samaj

A stakeholder meeting had been organised in order to invite the opinion of the local stakeholders regarding the implementation of the project activity. No significant negative impacts from the project activity had been identified during the meeting. The proposed project activity received unanimous support from the wide range of audience present during the meeting.

The meeting was well attended by a good number of audiences from variety of sectors in IISCO Steel Plant, Burnpur. Representatives from IISCO Steel Plant explained about the initiative of the project promoter of moving towards the new technology followed by a technical description on the project activity. They also explained about Global warming and how these projects can reduce emissions as well as contribute towards sustainable development.

E.2. Summary of the comments received:

The participants expressed their positive feedback on the initiative taken up by the project promoter. The local people also agreed to the fact that the project could possibly generate employment opportunities for them although in a small scale. They also expressed their goodwill for the environment friendly initiative.

A separate questionnaire had been circulated to the stakeholders and their comments are summarized and separately enclosed as Appendix A. The summary clearly indicates that all the stakeholders agree that the project activity will be helpful in the socio-economic upliftment of the people of the neighbouring area.

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

The participants had raised various questions mostly related to the technology and its role in reducing green house gas emission. All the questions were satisfactorily explained to the participants by the senior officials of SAIL and the consultants from Asia Carbon-Senergy Global consortium. The project promoter explained about the technical details, feasibility of the project activity and its impacts on environment. The participants commented that the technology is very new and clean technology and this technology can be replicated after the successful running of the project. Considering the comments made by the stakeholders, no significant negative impacts due to the project activity had been identified.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Steel Authority of India Limited (SAIL)
Street/P.O.Box:	50, JL Nehru Road, 3rd Floor
Building:	
City:	Kolkata
State/Region:	West Bengal
Postfix/ZIP:	700071.
Country:	India
Telephone:	+91 33 2282 1352, +91 33 2282 1353, +91 33 2290 4095.
FAX:	+91 33 22904089, +91 33 2282 1309
E-Mail:	sailemd@rediffmail.com
URL:	
Represented by:	
Title:	Executive Director
Salutation:	Mr.
Last Name:	Nag.
Middle Name:	
First Name:	Ranen
Department:	Environment Management Division
Mobile:	
Direct FAX:	+91 33 22904089.
Direct tel:	+91 33 2282 1353.
Personal E-Mail:	sailemd@rediffmail.com, ranennag@gmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING OF ANY KIND IS INVOLVED IN THE PROJECT ACTIVITY.

Annex 3

BASELINE INFORMATION
Please refer section B.6.3

ANNEX 4

MONITORING INFORMATION

As per the monitoring methodology ACM 0012 Version 3.2

TABLE 1

Parameters	Recording Frequency	Reporting Frequency	Archiving Mode
BF Gas Flow rate	Continuous	Daily	Electronic & Paper
Combustion Air Flow rate	Continuous	Daily	Electronic & Paper
Flue Gas Flow rate	Continuous	Daily	Electronic & Paper
BF gas inlet temperature	Continuous	Daily	Electronic & Paper
BF gas outlet temperature	Continuous	Daily	Electronic & Paper
Combustion air inlet temperature	Continuous	Daily	Electronic & Paper
Combustion air outlet temperature	Continuous	Daily	Electronic & Paper
Flue Gas inlet Temperature	Continuous	Daily	Electronic & Paper
Flue Gas outlet Temperature	Continuous	Daily	Electronic & Paper
Hot Metal Production	Daily	Daily	Electronic & Paper

TABLE 2

Parameters	Instrument	Accuracy Level	Calibration Procedure	Calibration Frequency
BF Gas Flow rate	Orifice Plate	95 – 100 %	By accredited agency	Once in a year
Combustion Air Flow rate	Orifice Plate	95 – 100 %	By accredited agency	Once in a year
Flue Gas Flow rate	Orifice Plate	95 – 100 %	By accredited agency	Once in a year
BF gas inlet temperature	Thermocouple/ pyrometer	95 – 100 %	By accredited agency	Once in six months
BF gas outlet temperature	Thermocouple/ pyrometer	95 – 100 %	By accredited agency	Once in six months
Combustion air inlet temperature	Thermocouple/ pyrometer	95 – 100 %	By accredited agency	Once in six months
Combustion air outlet temperature	Thermocouple/ pyrometer	95 – 100 %	By accredited agency	Once in six months
Flue Gas inlet Temperature	Thermocouple/ pyrometer	95 – 100 %	By accredited agency	Once in six months
Flue Gas outlet Temperature	Thermocouple/ pyrometer	95 – 100 %	By accredited agency	Once in six months

Appendix A

Summary of Stakeholder Consultation Meeting at IISCO Steel Plant

Sl. No.	Participants name	Category	Employment opportunities increased?	Whether land values are increased?	Infrastructure facilities are developed?	Whether you have learnt or exposed to new technology?	Whether you are facing any type of pollution (Air / Water / Sound) problems due to the project?	Whether electricity facilities are improved?	Whether your local area is improved?
1	Ram Hilis Roy	General secretary	YBNM	Y	YMMM	Y	N	Y	YMVVM
2	Gopa banerjee	W.V.S	YAMM	Y	YMVV	Y	N	Y	YVMVV
3	Sri benaran lal Agarwal	Presidency chamber of commerce	YCMM	Y	YNMU	Y	Y	E	EVMNM
4	Murarilal agarvalu	Secretary,chamber of commerce	YCMN	Y	YMMM	Y		E	EVMMM
5	Sudip saha	Employee	YCVV	Y	YVVV	Y	N	Y	YVMVV
6	Surash prasad	Local people	YB	N					
7	K.K.Chaudhuri	Employee	YCV	Y	YVMV	Y	N	Y	YVVVM
8	Kamal Kanti	Worker	YC	Y	YMMM		Y	Y	YMVMV
9	B.K.Das	Employee,CET	YAMM	Y	YMNM	Y	Y	Y	EVMVN
10	DilipRoy ghatar	Social worker	YCMM	Y	YVVM	Y	Y	Y	YMVVM
11	Randharma siji		YAVV	Y	YVVV	Y	N	Y	YVVVV
12	Ram kumar								
13	P.K.Paul	General employee	YAVV	Y	YVVV	Y	N	Y	YVVVV
14	Rartha sen gupta	counsellor	YAVV	Y	YVVV	Y	N	Y	YVVVV
15	Punam Hemran	Employee,I.S.P	YCVV	Y	Y	Y	N	E	EVV
16	Porodip K.R.Gosh	Senior planning assistant	YCVV	Y	Y	Y	Y	Y	YMMMM
17	Majumdar	Senior manager	YCVV	Y	YVVV	Y	N	Y	YVVVV
18	S.K.Den	Employee	YCVV	Y	YVVV	Y	Y	Y	YVVVV
19	Ajitha varma	W.V.S	YCVV	Y	YMVV	Y	N	Y	YVMVV
20	Deepa	Employee	YCVV	Y	YVVV	Y	N	E	E

21	K.M.Mukherjee	Employee,I.S.P	YCMM	Y	YMMM	Y	Y		
22	Smarajit Banerjee	General maintenance, electrical	YCVV	N	YVVV	Y	Y	Y	YVVVM
23	S.K.Sindh	Employee	YCMM	Y	YMMM	Y	N	N	E
24.	Mahesh singh Ghosh	AGM education	YCMM	Y	YMMM	Y	N	Y	YMMVV
25.	Ratan guha	Social worker	YC	Y	YVVM	Y	Y	Y	YVVM
26.	Prabhat kumar Anand		YCVV	Y	YVVV	Y	N	Y	YVVVV
27.	AM.Baeupil	Executive	YCVV	Y	YVVV	Y	N	Y	YVVV
28.	Goutam Malik	Employee, I.S.P	YCVV	Y	YVVV	Y	N	Y	YVVVV
29.	Utpal kumar singh	Employee, AITUC	NCMV	Y	YVVV	Y	Y	E	YVVVM
30.	Bijoy singh	Employee, I.S.P	YCMM	Y	YVVV		N	Y	YVMVM
31.	Ajay kr Roy	Foreman	YCVV	Y	YVVV	Y	N	E	EVVVV
32.	K.P.Das	AGM project	YCVV		YVVV	N	N	E	EVVV
33.	Tarit kumar mukhopadayay	AGM , I.S.P	YAMM	Y	YMMM	Y	N	Y	YMMVM
34.	Mumtaz Ahamed	Shift foreman	YCM	Y	YVVV	Y	Y	Y	YMVM
35.	Krishnendu gosh		YAVV	Y	YVVV	Y	N	Y	YVVVV
36.	Ranjith	Foreman	YCMM	Y	YVMM	N	N	Y	YMMVM
37.	B.K.Gosh	Executive	YCVV	Y	YVVV	Y	N	E	EVVVV
38.	M.K.Rout	Employee,I.S.P	YCVV	Y	YVMM	Y	N	Y	YVVVV

Y = Yes, N = No, B = Both Skilled & Unskilled Labours, S = Skilled Labours, U = Unskilled Labours V = Visible, M = Marginal E = Expected

Appendix B

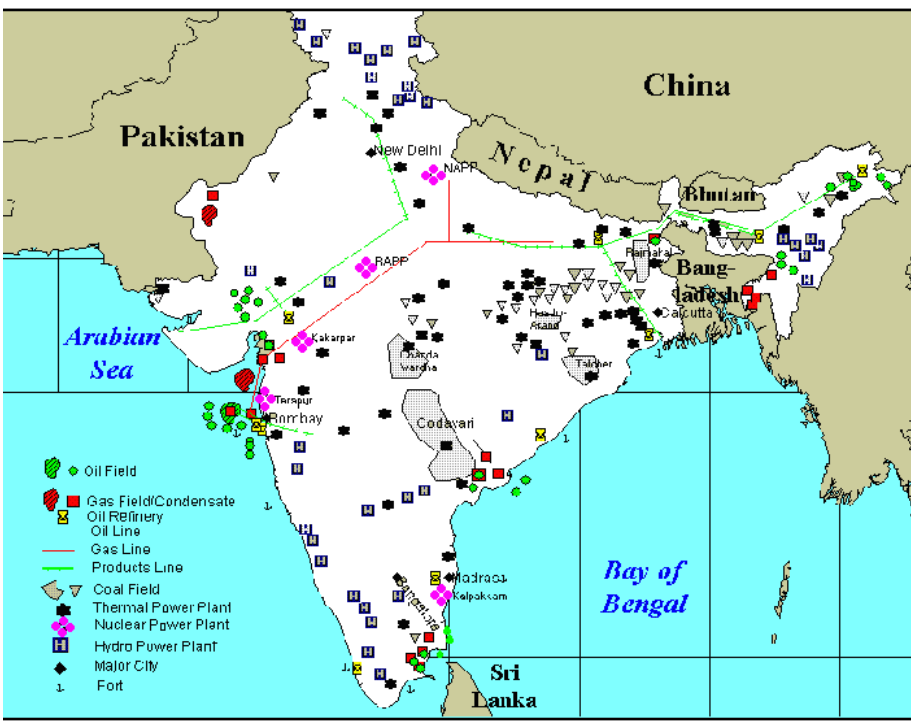
Lack of availability of renewable resources in the project location

As the wind and Hydel Projects only generate electrical power, the same shall not be applicable in the baseline scenario for the project requiring heat energy. Furthermore, as the grid connected Wind and/or Hydel-Power are not available through-out the year, these two sources cannot be chosen as the alternatives for the baseline scenario for a continuous process industry like steel making. However evidences on the non availability of renewable sources are furnished below:

A. DOCUMENTED EVIDENCES FOR HYDEL POWER

Report by Global Energy Network Institute , October 2006(link http://www.geni.org/globalenergy/library/energytrends/currentusage/renewable/Renewable-Energy-Potential-for-India.pdf) has mentioned that Hydro electric power generation depends on the annual rainfall and the potential is maximum in the states where annual rainfall is dominant or are in the Himalayan or river basin. The dominant annual rainfall is located on the north/eastern part of India: Arunachal Pradesh, Assam, Nagaland, Manipur and Mizoram, and also on the west coast between Mumbai (Bombay) and Mahe.

ENERGY MAP OF INDIA



Source: http://www.eia.doe.gov/emeu/cabs/india/indiamap.htm

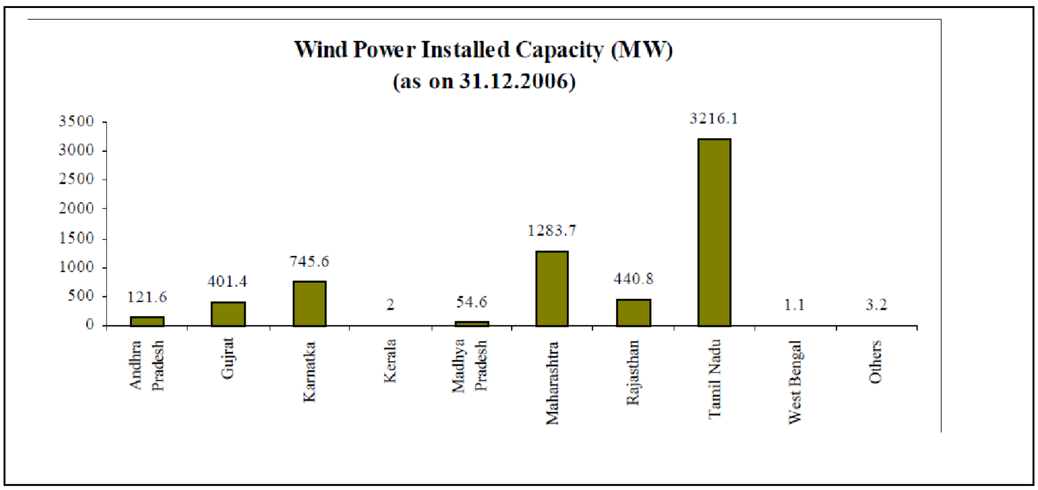
This was scattered and limited to the states of West Bengal and its nearby states like Jharkhand and Orissa. This is further substantiated by the home page of West Bengal Renewable Energy Development Agency (WBREDA)(Link:_ http://www.wbreda.org/energy-small-hydel.htm) stating that " there are a large number of perennial streams with adequate discharges in the hilly regions of Cooch-Bihar and the Sub-Himalayan region of West Bengal, which can be harnessed for generation of small hydro power" However, only 6 MW Hydel Power Generation facilities were installed in West Bengal during 2006, which were of small scales and scattered in nature.

As the Hydel power generation is seasonal, exploring the possibility of using 6 MW hydel power did not seem to be a feasible option for the project which needs constant and enormous supply of heat.

B. DOCUMENTED EVIDENCES WIND POWER:

Refer link (http://local-renewables.iclei.org/fileadmin/template/projects/localrenewables/files/Local_Renewables/Publications/RE_EE_report_India_final_sm.pdf)

As has been explained above, wind power generation is seasonal in nature and mainly wind power generation plants are installed in the windy areas, at southern and western coast of India. The link clearly demonstrates the fact that during 31/12/2006, wind power installed capacity in the state of west Bengal was 1.1 MW. Furthermore, there were no installations in the near-by states like Jharkhand and Orissa at the time of decision making.



Hence, the possibility of using wind energy as a source of alternative baseline scenario is ruled out as a steel plant need consistency in each and every operation. Even a small interruption of heat supply may cause serious problems in the up-stream and down-stream production facilities.

C. DOCUMENTED EVIDENCES FOR BIO MASS :

The use of equivalent amount of heat from a Bio mass source at the project location is practically not feasible as the consistent availability and consistent heat value for pre heating of air and fuel cannot be ensured from bio fuel based heat generation mechanism at the site itself since Bio mass in India is mainly sourced from rural areas in a scattered manner. Additionally, Collection and transportation of Bio mass from scattered sources have a great potential for considerable amount of GHG emissions and environmental pollution.

Furthermore, preheating of Fuel and Air with the Biomass heat is not prevalent in Steel Plant and that itself requires R & D project and lots of research pilot plant studies are required for establishing its reliability, consistency and operational efficiency.

Some of the applicable links in the public domain to establish the limitations of using Bio mass are as mentioned below:

a) Link : http://lab.cgpl.iisc.ernet.in/atlas/Tables/Tables.aspx (source Govt of India Web site, **Biomass Table**)

State-wise Biomass Data Based on Survey Data of year [2002-04] Considering All Biomass Class: All (Refer Attachment I) for details.

However, state wise Biomass availability or the Bio mass atlas after 2004 was not available at the time of decision making. Refer link : http://planningcommission.nic.in/aboutus/committee/wrkgrp11/wg11_renewable.pdf , Annexure IV , for the REPORT OF THE WORKING GROUP ON NEW AND RENEWABLE ENERGY FOR XITH FIVE YEAR PLAN (2007-12), Planning commission, Govt of India , (estimated Renewable energy potential) which mentions that "**a Biomass Atlas is under preparation which is expected to more accurately assess state-wise renewable energy potential from agro-residues.**"

b. Furthermore, use of Biomass in Steel Industry itself is a R&D project. This is further verified through the publicly available document of The World Steel Association. (link http://www.worldsteel.org/dms/internetDocumentList/fact-sheets/Fact-sheet_Breakthrough-technologies/document/Fact%20sheet_Breakthrough%20technologies.pdf)
It mentions that steel producers across the world are researching new production technologies that would reduce their Carbon footprint. The link also mentions that Biomass can be used to generate the reducing agent, either through Charcoal or Syn-gas. However, this R& D programme was later on taken up by Bluscope Steel, Australia and was successfully implemented through use of coal in Blast Furnace as a replacement of Coke.
(link:http://asdi.curtin.edu.au/csrp/_media/events/csrp08/Jahanshahi_CSRP08_C02BreakthroughOverview.pdf)
This is tenable evidence that at the time of decision making there is no use of Bio mass in steel plants all over the world.
Hence the option for using Biomass as a baseline scenario is ruled out as per Para (a) & (b) as explained above.
This was further substantiated with the letters from different Iron & steel Producers in India which were submitted to the DoE.

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