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:

Electrotherm 30 MW combined waste heat recovery and coal based captive power plant at Kutch

Version 01

01 October 2007

A.2. Description of the project activity:

The Electrotherm 30 MW combined waste heat recovery and coal based power plant at Kutch (hereafter, the "Project") developed by Electrotherm India Limited (EIL) (hereafter referred to as the "Project Developer") is a waste heat utilisation project at an iron and steel facility in Gujarat State in India (hereafter referred to as the "Host Country"). The total installed capacity of the power plant will be 30 MW, with a predicted power generation from waste heat recovery (WHR) of 79,571MWh per annum.

The Project will be developed at an integrated steel facility in Samikhiyali Village, Kutch District, Gujarat State. The facility was established in 2005, with an annual output of 216,000 t of finished iron and steel products including iron pipes and stainless steel. At the end of 2006 the company started the installation of their own Direct Reduction Iron (DRI) plant within the existing steel factory. The DRI plant will be equipped with two sponge iron kilns; the first kiln, with a capacity of 250 tonnes per day (TPD), was commissioned in December 2005[1] and the second kiln, with a capacity of 350 TPD, is expected to be fully operational by July 2008.

Currently the Project Developer is drawing electricity from the grid to supply power to its integrated steel plant. Due to high energy tariffs of the Gujarat State Electricity Board (GSEB) and the large energy requirement of the steel plant, the Project Developer is currently installing a thermal captive power plant (CPP) using coal[2] as fuel. The new CPP is expected to start power generation by December 2007. It will consist of a 30MW turbine which is supplied with steam from two fluidised bed combustion (FBC) boilers with a capacity of 65 tonnes per hour (TPH) each.

The Clean Development Mechanism (CDM) project is the installation of two waste heat recovery boilers with a capacity of 28.5 TPH and 42 TPH respectively in order to generate power from the hot flue gases from the sponge iron kilns. These gases are currently vented into the atmosphere as waste heat. The total amount of waste heat consisting of approximately 19% CO_2, 15% H_2O, 62% N_2, 3% O_2 and 0.5% CH_4 is currently vented into the atmosphere after being cooled and treated by electrostatic precipitators (ESP) to ensure that the waste gas emissions are within the prescribed norms. The electricity generated by the WHR boilers would in the absence of the CDM be generated by the baseline coal fired captive power generators, a technology with a higher carbon intensity.

1 After initial production of about 2 months the kiln had to shutdown due to operational problems and commercial production was taken up again in September 2006

2 Hereinafter the term 'coal' in relation to the baseline captive power plant will be used as a synonym for the fuel mix used in the baseline. The fuel mix will consist of different combinations of several fossil fuels like domestic coal, imported coal, Kutch lignite, coal char, dolo char and coal fines. Depending on their relative prices and availability, the project developer will decide upon the actual fuel mix to be used in the power plant at a given point of time in order to realize the lowest cost of power generation of the baseline power plant.

The project is contributing to sustainable development of the Host Country. Specifically, the project:

- Increases employment opportunities in the area where the project is located: approximately seventy persons will be employed for the operation of the power plant
- Enhances the local investment environment and therefore improves the local economy
- Diversifies the sources of electricity generation, important for meeting growing energy demands and the transition away from fossil fuel-supplied electricity generation
- Makes use of waste energy resources for sustainable energy production
- Reduces the use of fossil energy sources

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)	Electrotherm India Limited (private entity)	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Group PLC (private entity)	No

Further contact information of project participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

India (the "Host Country")

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

Gujarat State, Kutch District

A.4.1.3. City/Town/Community etc:

Samikhiyali Village, Bhachau Taluk

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

The geographical location is latitude N 23° 18' 17.34 / longitude E 70° 28' 37.25.
These GPS coordinates are for the location of the steel factory in which the CDM project takes place.

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

According to Annex A of the Kyoto Protocol, the project activity falls under UNFCCC Sectoral Scopes:

- 1-Energy Industries (renewable/non-renewable sources) and
- 4-waste handling and disposal.

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

The Project is a waste heat recovery power generation project using waste flue gas from two sponge iron kilns in the direct reduction iron plant of the Electrotherm steel facility, with a total installed capacity of 30 MW. It is expected that 79,571MWh will be generated from the waste heat energy content of the flue gases generated in the two DRI kilns.

In the iron reduction process in the steel plant, coal and iron ore are passed through two rotary kilns at high temperatures (over 1,000° C) to reduce the iron ore to sponge iron. The reduction process yields, among other things, carbon dioxide and carbon monoxide. These gases leave the kiln at high temperatures (950° C) and may therefore be utilised to generate power. After leaving the kiln the hot gases are passed through an After Burner Chamber (ABC) where further oxidation of the gases occurs, i.e. carbon monoxide to carbon dioxide. The gases are then fed to waste heat recovery boilers and drawn through electrostatic precipitators (ESP) and ultimately released via the stack.

The project involves the installation of two WHR boilers including After Burner Chambers (ABC). These components are added to other thermal power plant equipment like one 30 MW turbine and one generator, one steam header, a water supply and a cooling system. All this thermal power plant equipment is already part of the baseline and the project activity only adds a WHR boiler including its associated components like water and steam pipes as well as the ABC.

The waste heat recovery boiler technology employed in the project activity is available in India. The technology utilized in the CDM project will be two Cethar Vessels WHR boilers with a capacity of 28.5 TPH and 42 TPH respectively.

Table A 4-1 The specification of major equipment in the project activity[3]

Name	Number	Technical parameter		Manufacturer
Generator	1	Make: Standard power: Standard rotational speed: Output voltage:	HTP/JPEF 30.0 MW 3000/min 11 kV	Hangzhou Steam Turbine Co. Ltd
Steam turbine	1	Make: Standard power: Standard rotational speed: Pressure of main gas: Temperature of main gas:	HTC 30.0 MW 3000/min 63 Bar 490 C	Hangzhou Steam Turbine Co. Ltd

[3] Turbine and generator are part of the baseline, WHR boiler is equipment installed in the CDM project

WHR boiler	1	Capacity: 28.5 TPH Type of firing: traveling grate working pressure: 65 Bar working temperature: 490°C Steam outlet Temperature: 490°C	Cethar Vessels Pvt Ltd
	1	Capacity: 42 TPH Type of firing: traveling grate working pressure: 65 Bar working temperature: 490°C Steam outlet Temperature: 490°C	Cethar Vessels Pvt Ltd

The Project started construction in October 2006 and the total construction period was estimated to be 18 months. The project is expected to start operation in January 2008 with one WHR boiler and in July 2008 with the second WHR boiler.

Table A 4-2 Timeline showing the installation of the major equipment involved in the project activity, and whether this equipment was already existing on site at the start of the crediting period ('baseline') or is being installed as part of the CDM project activity ('project')

SN	Activity	Baseline or Project	Construction Start	Operation Start
1	Installation of Sponge Iron Kiln I	Baseline	May-05	December-05
2	Installation of Sponge Iron Kiln II	Baseline	April-07	March-08
3	Installation of FBC Boiler I	Baseline	October-06	October-07
4	Installation of FBC Boiler II	Baseline	October-06	November-07
5	Installation of Waste Heat Boiler for Kiln I	Project	October -06	January-08
6	Installation of Waste Heat Boiler for Kiln II	Project	September-07	July-08
7	Installation of 30MW Turbine	Baseline	November-06	November-07
8	Start of power generation	Project		November-07

The Project Developer has not operated its own waste heat recovery power plant before. The setup of the power plant, especially the fact that two fuel sources provide steam for one turbine, requires a skilled and experienced workforce to operate the plant at its highest efficiency. No experience on how to operate and maintain a WHR power plant is available in the company, therefore an additional experienced workforce has to be employed and provision of training is required. A total of approximately seventy people will be involved in its operation and maintenance. Additional training for those employees is required and will be provided by six external engineers for a period of at least one year after commissioning of the first WHR boiler. The engineering company HIQ Power Associates Ltd. which is the Engineering Procurement Construction (EPC) - contractor for the project is providing specialists for training of the staff in areas like civil, mechanics, electrics and instrumentation during the training period.

Table A 4-3:The main technical parameters involved in the project are described in the table below:

		Source
Total installed capacity (MW)	30	Detailed Project Report (DPR)
Operating time yearly (days)	289	Obtained from 1st year

		operational data of kiln I
Parasitic Power loss (%)	10.5%	Detailed Project Report (DPR)
Average kiln load factor	79%[4]	Obtained from 1st year operational data of kiln I
Expected annual power generation from the WHR component (MWh)	79,571MWh	Calculation

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

The estimation of the emission reductions in the first crediting period is presented in the table below:

Table A4-4: Estimation of the emission reductions in the first crediting period

Year	**The estimation of annual emission reductions (tCO2e)**
2008	63,789
2009	98,137
2010	98,137
2011	98,137
2012	98,137
2013	98,137
2014	98,137
Total estimated reductions (tonnes of CO_2e)	**652,614**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**93,231**

Refer to section B.6.3 for further details on the quantification of GHG emission reductions associated with the project.

A.4.5. Public funding of the project activity:

No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Title: "Consolidated baseline methodology for GHG emission reductions for waste gas or waste heat or waste pressure based energy system"

4 Kiln capacity utilization of 63% over 365 days, considering kiln downtime for maintenance the load factor is 79% over 289 days

Reference: UNFCCC Approved consolidated baseline methodology ACM0012 / Version 01, adopted at EB 32

ACM0012 also refers to the latest version of ACM0002: "Consolidated Methodology for Grid-connected Electricity Generation from Renewable Sources" and the "Tool for the Demonstration and Assessment of Additionality".

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

Methodology applicability conditions	Proposed Project Activity
The methodology applies for project activities that utilise waste gas and/or waste heat as an energy source for: • Cogeneration; or • Generation of electricity; or • Direct use as process heat source; or • For generation of heat in element process (e.g. steam, hot water, hot oil, hot air)	The Project activity will generate electricity by utilising waste heat sources vented from the direct iron reduction process in a steel plant.
Energy generated in the project activity may be used within the industrial facility or exported outside the industrial facility.	The energy generated by the project activity will be used within the industrial facility.
Energy in the project activity can be generated by the owner of the industrial facility producing the waste gas/heat or by a third party within the industrial facility.	The energy will be produced by the owner of the industrial facility producing the waste gas.
Regulations do not constrain the industrial facility generating waste gas from using the fossil fuels being used prior to the implementation of the project activity.	There are no regulations constraining the industrial facility generating waste gas from using the fossil fuels being used 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 implemented at two newly installed sponge iron kilns.

The waste gas/pressure utilised in the project activity was flared or released into the atmosphere in the absence of the project activity at the existing facility. This shall be proven by either one of the following: o 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. o **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 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. o **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. o **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. o **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.	Not applicable, since the project will be installed at a new facility

The credits are claimed by the generator of energy using waste gas/heat/pressure. o In case the energy is exported to other facilities an agreement is signed by the owner's of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) 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 credits are claimed by the generator of energy using waste heat. Energy is not exported to other facilities.

Hence, as the applicability criteria are met, ACM0012 Version 01 is applicable for the project activity.

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

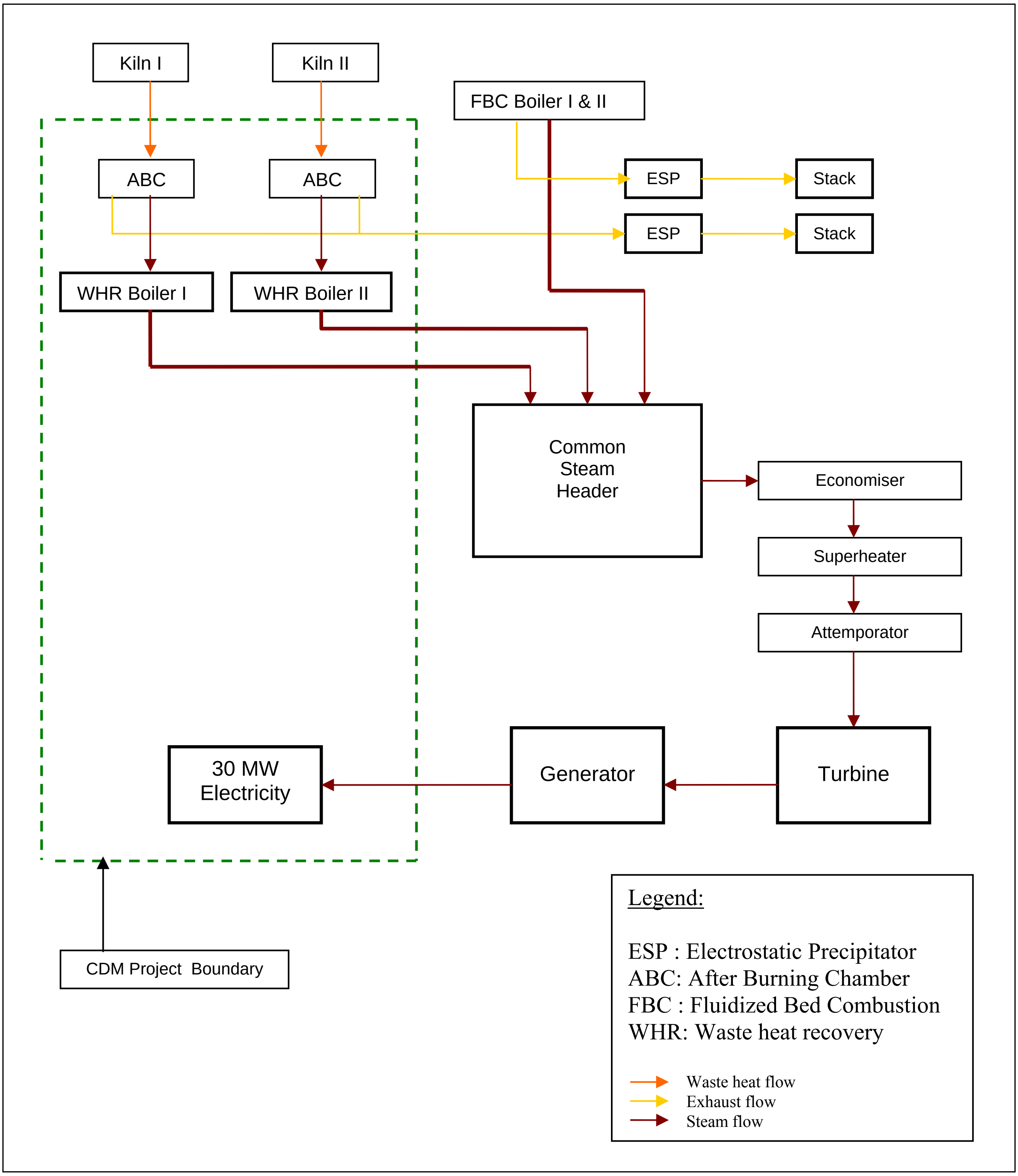
The GHGs included in or excluded from the project boundary are listed as follows:

Baseline			
Source	**Gas**	**Included ?**	**Justification / Explanation**
Electricity generation, grid or captive source	CO2	Included	Main Emission Source
	CH4	Excluded	Excluded for simplification. This is conservative.
	N2O	Excluded	Excluded for simplification. This is conservative.
Fossil fuel consumption in boiler for thermal energy	CO2	Included	Main Emission Source
	CH4	Excluded	Excluded for simplification. This is conservative.
	N2O	Excluded	Excluded for simplification. This is conservative.
Fossil fuel consumption in cogeneration plant	CO2	Included	Main Emission Source
	CH4	Excluded	Excluded for simplification. This is conservative.
	N2O	Excluded	Excluded for simplification. This is conservative.
Baseline emissions from generation of steam used in the flaring process	CO2	Included	Main Emission Source
	CH4	Excluded	Excluded for simplification. This is conservative.

	N2O	Excluded	Excluded for simplification. This is conservative.

Project Activity			
Source	**Gas**	**Included ?**	**Justification / Explanation**
Supplemental fossil fuel consumption at the project plant	CO2	Included	Main Emission Source
	CH4	Excluded	Excluded for simplification.
	N2O	Excluded	Excluded for simplification.
Supplemental electricity consumption	CO2	Included	Main Emission Source
	CH4	Excluded	Excluded for simplification.
	N2O	Excluded	Excluded for simplification.
Project Emissions from cleaning of gas	CO2	Included	Only in case waste gas cleaning is required and leads to emissions related to the energy requirement of the cleaning
	CH4	Excluded	Excluded for simplification.
	N2O	Excluded	Excluded for simplification.

The following diagram illustrates the project boundary:



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

Selection of the baseline scenario:

The selection of the baseline scenario is followed in accordance with ACM0012 / Version 1.

The baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s). Realistic and credible alternatives are determined for:

- Waste heat use in the absence of the project activity; and
- Power generation in the absence of the project activity; and
- Steam/heat generation in the absence of the project activity

Step 1: Define the most plausible baseline scenario for the generation of electricity and for the use of waste gas

According to ACM0012, the baseline candidates should be considered for the following facilities:

- For the industrial facility where the waste heat is generated; and
- For the facility where the energy is produced; and
- For the facility where the energy is consumed.

Since the waste heat is generated in the facility where power is generated as well as consumed, only one facility is considered for determination of the baseline scenario.

a) Use of the waste heat

To determine the baseline scenario for the use of waste heat, the following options should be considered:

W1 Waste heat is directly vented to the atmosphere without incineration;
W2 Waste heat is released to the atmosphere after incineration or waste heat is released to the atmosphere;
W3 Waste heat is sold as an energy source;
W4 Waste heat is used for meeting energy demand.

W1: Waste heat is directly vented to atmosphere without incineration;
After leaving the kiln, hot waste flue gases would be released into the atmosphere without incineration since the methane content is too low (0.5%) for the gas to be effectively combusted.

W2: Waste heat is released to the atmosphere after incineration or waste heat is released to the atmosphere;
Not applicable, since waste heat cannot be incinerated, due to the low hydrogen and methane content, and in addition, no regulations are in place that call for the incineration of waste gas.

W3: Waste gas/heat is sold as an energy source;
There is no existing infrastructure available to export the waste heat for third party use. No third party is located nearby the plant that could use the waste heat.

W4: Waste heat is used for meeting energy demand.

There is no useful application for waste heat in the sponge iron manufacturing process. Waste heat would therefore be left unused and vented into the atmosphere in the absence of the project activity. So far no other use for waste heat has been developed in sponge iron manufacturing. As demonstrated in section B.5., the majority of sponge iron plants usually release waste heat into the atmosphere[5] and the installation of waste heat recovery boilers has only been taken up by a minority of plants. Among all captive power plants in the steel sector in India, coal represents with over 90% the main fuel source.[6]

Out of the different baseline options, the only realistic option is W1: Waste heat is directly vented to the atmosphere without incineration. This is in compliance with all legal requirements, and there are no legal obligations on the project developer to utilise waste heat at the steel works. This scenario is therefore taken as the baseline scenario for the use of waste heat.

b) Power generation

To determine the baseline scenario for energy generation, the following options are considered:

P1 Proposed project activity not undertaken as a CDM project activity;
P2 On-site or off-site existing/new fossil fuel fired cogeneration plant;
P3 On-site or off-site existing/new renewable energy based cogeneration plant;
P4 On-site or off-site existing/new fossil fuel based existing captive or identified plant;
P5 On-site or off-site existing/new renewable energy based existing captive or identified plant;
P6 Sourced from Grid-connected power plants;
P7 Captive Electricity generation from waste gas with lower efficiency than the project activity;
P8 Cogeneration from waste gas.

P 1. Proposed project activity not undertaken as a CDM project activity;
The Project Developer may set up waste heat recovery systems to generate electricity. However, this alternative faces a number of barriers (as detailed in Section B.5) making it an unattractive investment. The major risk associated with WHR technology is the uncertainty of the availability and quality of the waste heat as a fuel, and therefore the reliability of power generation. At the same time, this alternative is not common practice in the region according to the analysis of Step 4 of Section B.5. Hence this alternative cannot be taken as a part of the baseline scenario.

P2/P3. On-site or off-site existing/new fossil fuel fired/renewable energy cogeneration plant;
There is no heat or steam requirement at or near the industrial facility where the proposed project is implemented. Therefore this alternative can be excluded as a baseline scenario.

P4. On-site or off-site existing/new fossil fuel based existing captive or identified plant;
This scenario represents the continuation of current practices. Presently, a 30 MW thermal captive power plant is being implemented anyway to meet internal power demand of the steel plant. Continuing to use this captive power plant would incur no additional investment costs, and would represent a continuation of the business as usual practice for a steel mill in the host country since coal represents over 90% of the fuel source of all captive power plants in the steel sector in India.[7]

5 As demonstrated in step 4 of section B5

6 Captive Power Plants: Case Study of Gujarat, India; page 36

7 Captive Power Plants: Case Study of Gujarat, India; page 36

Though coal prices, especially for high grade coal, are under upward price pressure due to capacity expansion of the power and the sponge iron sector, power generation from coal will remain competitive since other fossil fuel prices like natural gas (see below) are increasing as well. Biomass prices are expected to further increase due to the installation of new biomass power plants. Indeed, the majority of biomass power projects are realised as CDM projects since they are confronted with risks relating to fuel price hikes.[8]

The Project Developer also has the option of generating captive power using diesel oil or furnace oil. However, diesel oil or furnace oil based power plants are not feasible because building such a plant would incur significant additional capital expenditure, without generating significant savings in fuel costs compared to coal (see table B.4.-1). This option is economically not feasible since it involves high capital costs as well as a high cost of power generation.

Although natural gas is available in the western region of India, where major domestic gas fields exist, installing a new natural gas based captive power plant to replace the existing coal fired power plant would represent significant investment costs, as well as incurring a higher cost per unit of power generation (see table B.4.-1). Furthermore, security of gas supply also poses a barrier to the use of this alternative. A study by the International Energy Agency (IEA)[9], identified concerns about gas supply security and price stability, , one reason why coal remains the main energy source in the country. It is shown that the gas supply-demand gap in India will increase in the future. Domestic gas production is insufficient to meet demand, increasing the country's dependency on gas imports from international markets. In 2004/05, gas fired power plants had to operate at a low load factor of 58% due to shortage of gas supply. Based on Liquefied Natural Gas prices, the power generation cost from gas was Indian Rupee (INR) 2.45 in Gujarat in 2004/05, which is higher than the cost of generation from coal (below INR 2.00; see table B.4.-1). The study mentions that due to the price pressure from international markets, this price level is expected to increase in the future.

Because of the specific macroeconomic environment in the state of Gujarat, especially the high tariffs of the GSEB[10], unreliability and poor quality of the grid, and a favourable regulatory framework for captive power generation (namely resolution No. CPP 1197/2253/PP (1998) related to captive power projects)[11], industries which require medium to large amounts of energy are installing CPP using coal, gas or naphtha as fuel.[12] Since natural gas as a fuel source faces certain risks, and since the investment costs as well as the generation cost are lower for coal (see table B.4.-1), a coal based CPP is the only plausible baseline scenario falling under this option.

P5. On-site or off-site existing/new renewable energy based existing captive or identified plant;
Another baseline option for power generation is a power plant using renewable energy sources like biomass or wind. However, such power plants face different barriers like higher investment cost and higher cost of power generation as compared to coal (see table B.4.-1). Due to the high investment cost and risks of such projects, and given that in the baseline the project developer already has a coal fired captive power plant that can meet its needs without further capital investment, the construction of a

8 See PDD's of several biomass based power projects proposed or registered as CDM project with the UNFCCC

9 International Energy Agency (IEA); Paper: Focus on Asia-Pacific, Gas fired power generation in India – Challenges and Opportunities, http://www.iea.org/textbase/work/2006/gb/papers/power_india.pdf, 30.08.07

10 INR 4.05 INR/kwh, see electricity bill of EIL

11 Captive Power Plants: Case Study of Gujarat, India; page 23 ff

12 Captive Power Plants: Case Study of Gujarat, India; page 32

renewable energy power plant using biomass or wind is not feasible for the project developer and cannot be considered as a viable baseline alternative.

Out of the different options for captive power generation, a captive power plant based on coal (continuation of the current situation) is the most attractive baseline alternative available to the project promoter due to zero investment costs, and lower operating costs compared to switching to other fossil fuels such as gas.

P6. Sourced from Grid-connected power plants;
The electricity tariff of INR 4.09 per kWh[13] is high compared to captive thermal power generation costs and the steel plant would be affected by power cuts imposed by the grid[14] resulting in production losses. Due to the high unit cost of power as well as the risk of production losses the import of power from the grid is economically not attractive for the Project Developer. This alternative therefore is not considered a viable baseline scenario.

P7. Captive Electricity generation from waste gas (this scenario represents captive generation with lower efficiency than the project activity.);
This scenario involves generation of electricity using waste heat, at a lower efficiency than the CDM project, and faces numerous barriers to its development, as outlined in section B.5. Generation of a similar quantity of electricity using waste heat, with a lower efficiency than the project activity, would mean that more waste heat would be required to generate the same quantity of electricity. This is not viable since there are no other unused sources of waste heat available. If the deficit of electricity generation were supplied using the coal boilers, in addition to a waste heat facility of lower efficiency, this alternative could theoretically be implemented. However, it would face similar technological and other barriers to the project activity. Furthermore installation of less efficient equipment would pose additional risks of reliability, downtime due to failure, and increased operation and maintenance costs. The technical difficulties of using waste gas, including the corrosive nature of the gas, the variable gas quality and availability, and the difficulty in hiring and training qualified staff to operate the equipment, would be even more acute for less efficient, less advanced equipment. Therefore this scenario faces similar or stronger barriers to scenario P1, and is therefore not considered a viable baseline alternative. These barriers are discussed in detail in section B.5.

P8. Cogeneration from waste gas.
Not applicable since steam is not required within or near the industrial facility.

Table B.4 – 1: Investment cost and cost of power generation of different technologies[15]

Alternative	***Investment cost per MW installed capacity (million Indian Rupee INR)***	***Unit cost of power generation (Indian Rupee INR/kWh)***	***comments***

13 see electricity bill of EIL

14 Captive Power Plants: Case Study of Gujarat, India; page 23 ff

15 Captive Power Plants: Case Study of Gujarat, India; page 20

Grid Electricity	15	INR 4.09/kWh[16]	0.5 million INR deposit required per MW; uneconomical high operating cost, unreliability of power supply.
Coal/lignite	42.5 – 52.5	1.59 – 1.92	Economically most attractive alternative due to low generation cost.
Diesel oil / furnace oil	7.5 – 15	3.5 – 4.6	Not economically due to high generation cost.
Natural Gas	42.5 – 50	2.3 – 3.3[17]	Not economically due to high generation cost, fuel availability and price risk.
Wind[18]	45 – 55	2.25 - 2.75	Not economically due to high investment cost and high power generation cost
Biomass	48[19]	1.70 - 2.05[20]	Not economically due to high investment cost and high power generation cost

In view of the above, the only attractive alternative to the Project Developer is to continue to operate the coal fired captive power plant. Generating captive power using coal is in compliance with Host Country regulation. Hence, a coal based captive power plant (scenario P4) is taken as the baseline scenario for power generation for the Project Developer.

c) Steam/heat generation

Not applicable since the project activity does not generate process steam/heat.

STEP 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable

As demonstrated above, coal is the most attractive baseline fuel due to the low investment and low cost of power generation.

Coal is available in the Host Country in abundance. The country produces 55% of its electricity from this source.[21] There are large coalfields existing in the eastern part of India, and in addition India imports coal

16 see electricity bill of EIL

17 International Energy Agency (IEA); Paper: Focus on Asia-Pacific, Gas fired power generation in India – Challenges and Opportunities, http://www.iea.org/textbase/work/2006/gb/papers/power_india.pdf, 30.08.07

18 http://mnes.nic.in/business%20oppertunity/pgtwp.htm

19 http://www.gefweb.org/Documents/Council_Documents/GEF_C20/CC_-_India_-_Biomass.pdf, page 12

20 http://www.leonardo-energy.org/drupal/files/essentials3%20-%20Biomass%20Power%20Gen.pdf?download

from abroad. The state of Gujarat is well connected by ports through which imported coal is supplied to India. Therefore, no supply constraints or shortages of coal as the principal energy source in the Host Country are expected in the future.

After the consideration of different baseline alternatives for power generation and alternative uses of waste gas, as well as the identification of the most plausible choice of the baseline fuel, it can be concluded that the baseline is the generation of an equivalent amount of electricity by a coal based captive power plant. Accordingly, the baseline scenario emission factor of the displaced electricity has been calculated using the IPCC (2006) emissions factor for coal.

Table B 4-2: Key Information and Data Used to Determine the Baseline Scenario

Variable	Value / Unit	Source
CO_2 emission factor of fuel used in Baseline (IPCC value)	25.8 tC/TJ	IPCC 2006
Power plant efficiency	26.87%	Manufacturer' data
Electricity generation of the project in year y	79,571MWh	calculation
Installed capacity	30 MW	Detailed Project Report

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):

The start of the crediting period of this project activity is not prior to the date of registration, however for the assessment of additionality it is important to note that the CDM was taken into account for the investment decision and in the planning stage of the project.
After negotiations with a carbon buyer, The company signed an Emission Reduction Purchase Agreement on 3rd of October 2006, prior to the start of the project activity after several months of discussions with the buyer, and after a Due Diligence was undertaken by the buyer. The director for strategic planning of the project developer had already implemented a WHR CDM project in his earlier assignment and was well aware of the risks such type of projects are confronted with, and therefore was aware of and considered CDM financing throughout the planning and development of the project.

The determination of project scenario additionality is done using the CDM consolidated Tool for the demonstration and assessment of additionality (version 3 adopted at EB29), which follows the subsequent steps:

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

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

The discussion in section B.4. shows that the baseline scenario is the generation of electricity by a captive power plant using coal as a fuel. Therefore the two following alternatives to the project scenario are considered:

21 Ministry of Power: Annual Report 2005/06

Alternative 1. The proposed project activity not undertaken as a CDM project activity, and

Alternative 2. On-site existing coal based captive power plant;

Sub-step 1b. Consistency with mandatory laws and regulations

There are no mandatory laws compelling the project developer to develop this type of renewable energy facility. Therefore the baseline alternatives do not contradict any mandatory laws or regulations.

Step 3. Barrier analysis

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

a) Technological barriers

The success of the proposed CDM project is dependent upon the quality and availability of the fuel it uses to generate power since the power output is the main source of project revenues. Power output and hence the project economics are affected by the quality and availability of waste heat; its specific characteristics as discussed below therefore pose a serious threat to the success of the project.

Waste flue gas quality and availability

One major problem of using waste heat for power generation is the quality (energy content) and amount of the flue gases used in the boiler. The quality of waste heat is dependant on its temperature and pressure. Temperature, pressure and amount of waste heat vary over time and are dependant on the process where waste heat is generated. Changes in the fuel (waste gas) consistency occur according to the operational performance of the sponge iron kilns from which the gases are released, as well as from changing quality and composition of the iron ore and coal used as feedstock in the kiln. Due to this dependency on a core process of the project developer's main business it is not possible to directly control the power output from WHR boilers. Output levels of sponge iron are demonstrated in table B. 5-1 and B. 5-2. As can be seen from the tables, the actual output of the kiln varied from a low of 1,887 tons per month to a high of 7,088 tons per month, which means the capacity utilization varied between 25% and 94%, during the first year of operation. Such large fluctuations in sponge iron production mean significant fluctuations in the electricity output of the waste heat recovery based power generation system, and therefore in revenues from the project. Since the total power requirement of the downward processes of the steel unit remains more or less constant[22] even during lower sponge iron production intervals, this dependency of WHR technology on the sponge iron output makes the attractiveness of the project highly uncertain because of the lower asset utilization and increased coal consumption.

Apart from the underlying sponge iron production output levels from which waste heat is released, other critical factors impacting the operational parameters of the kiln, and therefore the waste heat flue gas characteristics, are the quality of iron ore and coal used as raw material in the kiln[23]. An

22 The sponge iron kiln only requires minimum amount of energy to operate, which is insignificant as compared to the steel factory.

23 Steelworld.com – Steal Research Papers: Coal : The most critical raw material for sponge iron making, http://www.steelworld.com/coalcri.htm, 30.08.2007

uninterrupted long-term supply of high quality coal with a homogenous consistency is essential in order to guarantee optimal operational conditions of the kiln. However, such a supply is not fully guaranteed in India due to the limited domestic availability of such coal types, as well as existing competition for such high quality raw material from other sponge iron plants and the power sector.[24] Both industrial sectors are expanding capacities which creates rising competition for high quality raw material. Imported high grade coal is expensive and logistically difficult to supply.[25] While the power sector remains competitive since it can shift to low grade raw material and select the cheapest fuel option[26], iron making industries will suffer from a competition in the high grade coal segment. Either the cost of iron production increases, production output decreases or product quality deteriorates from poor raw material quality.

Similarly, low quality iron ore also affects the operational behaviour of the kiln in a negative manner. Only low quality iron ore is available in the Indian market[27]. Due to the fact that there is currently a huge capacity expansion happening in the sponge iron sector in India, the supply of high quality iron ore will be further constrained in the future.[28] The project developer also uses imported iron ore pallets from Bahrain which have a high fine content and changing quality.

Unavailability of high quality iron ore results in the utilisation of ore with a high content of fines which causes problems in the WHR boiler operation resulting in additional cost and downtime for cleaning of the boiler and other equipment.[29] Using such ore with a high content of fines requires a higher amount of coal to be used in the kiln which results in a higher particulate load of the flue gas leaving the kiln. This particulate matter removes some energy from the combustion process, thereby reducing the actual usable energy at the WHR boiler inlet.

Changing flue gas quality, like varying temperature and pressure of the gas, also affects the steam parameters and hence turbine efficiency. Lower steam inlet temperature and pressure at the turbine hampers turbine efficiency and increases steam consumption inside the turbine.[30]

Waste heat recovery boilers are unavailable for power generation more frequently compared to coal boilers due to the fact that the kiln requires regular shutdown for maintenance. On an average[31], the sponge iron kiln is operating for 289 days a year (see table 5-1) whereas a coal boiler usually operates up to 350 days a year.

In addition to the technical difficulties listed above, which make power output from a waste heat recovery project variable and uncertain, market conditions for raw material and sponge iron might also

http://www.steelworld.com/coalcri.htm, 30.08.2007

24 Steelworld.com – Steal Research Papers: Coal : The most critical raw material for sponge iron making, http://www.steelworld.com/coalcri.htm, 30.08.2007

25 Ministry of Coal, Government of India: The Expert Committee on Road Map for Coal Sector Reforms, New Delhi, December 2005, page 58

26 The captive thermal power plant in the baseline will select the cheapest fuel option as described under footnote 1 which makes it more competitive as compared to all other baseline options

27 P.R.K. Raju: Sponge Iron Industry – An overview of problems and solutions; published in: Steelworld, July 2005; http://www.steelworld.com/technology7.pdf, 30.08.2007

28 P.R.K. Raju: Sponge Iron Industry – An overview of problems and solutions; published in: Steelworld, July 2005 http://www.steelworld.com/technology7.pdf, Joint Plant Commitee: "Survey of Indian Sponge Iron Industry 2005-06 – Highlights and findings, 2005-06"

29 http://www.rimbach.com/scripts/Article/PEN/Number.idc?Number=12

30 Patel M.R., Navin Nath - Improve Steam Turbine Efficiency, http://www.iffco.nic.in/applications/Brihaspat.nsf/6dca49b7264f71ce65256a81003ad1cb/fddd5567e90ccfbde52569160021d1c8/$FILE/turbine.pdf, 30.08.2007

31 This data is taken from the operational performance of the existing sponge iron kiln I during its first year of operation

impact the level of power generation from the WHR power plant, since increasing raw material prices for iron ore in combination with a decrease in sponge iron prices[32] might result in a reduction of sponge iron production. At the beginning of 2006, seventy sponge iron plants and over hundred iron units in Chattisgarh State had to shut down their production due to the unavailability of iron ore[33]. A coal based power plant would be unaffected by such a reduction in sponge iron production since it is not dependent on waste heat production from the kiln operation.

The above mentioned reasons mean that the power output, and therefore investment attractiveness of a waste heat recovery power plant, is highly uncertain. In the event of unavailability of high grade coal due to the aforementioned facts, a coal based captive power plant can still operate without any loss of output since it is not dependant on waste heat availability but can use a higher amount of lower grade coals that are readily available domestically in order to produce the same electricity.[34]

Apart from the availability of fuel for a coal based power station, such projects can select the cheapest fuel mix available. In the baseline, the project developer will use coal char, which is a by-product of the iron reduction process having a NCV of 2800 kcal/kg, to co-fire in the FBC boiler along with other fuels like imported coal, domestic coal and Kutch lignite[35]. This coal char is a zero-cost fuel for the project developer and it is expected that coal char will constitute about 10% of the total fossil fuel to be used. This further decreases the fuel cost in the baseline and improves the economics of a fossil fuel power plant alternative. Being located in vicinity to a coal belt (Kutch coal fields), the project developer also has access to cheap fossil fuel sources (Kutch lignite). Depending on relative prices of imported coal, domestic coal and kutch lignite, as well as the availability of no-cost coal char, the project developer will optimize the fuel mix of the thermal power plant in order to realize the lowest fuel cost combination.

Table B. 5-1: Operational data of the kiln[36]

	actual (tons)	days	capacity (TPD)	maximum capacity (TPD)	relative output capacity (TPD)	capacity utilization	load factor
Sep-06	4001	26	250	7500	6500	53.3%	61.6%
Oct-06	2121	16	250	7500	4000	28.3%	53.0%
Nov-06	1887	13	250	7500	3250	25.2%	58.1%
Dec-06	5603	29	250	7500	7250	74.7%	77.3%
Jan-07	6350	31	250	7500	7750	84.7%	81.9%
Feb-07	3340	17	250	7500	4250	44.5%	78.6%
Mar-07	5768	28	250	7500	7000	76.9%	82.4%
Apr-07	4178	23	250	7500	5750	55.7%	72.7%
May-07	7088	31	250	7500	7750	94.5%	91.5%
Jun-07	6778	30	250	7500	7500	90.4%	90.4%

32 .R.K. Raju: Sponge Iron Industry – An overview of problems and solutions; published in: Steelworld, July 2005 http://www.steelworld.com/technology7.pdf

33 Ban on ore prices gain momentum; published in Steelworld, January 2006, http://www.steelworld.com/analysis0106.pdf

34 The boiler volume and fuel handling systems are designed to use low grade fuel of 4000 kcal/kg in the absence of higher grade fuel to produce the same energy output as compared to high grade fuels of up to 6500kcal/kg

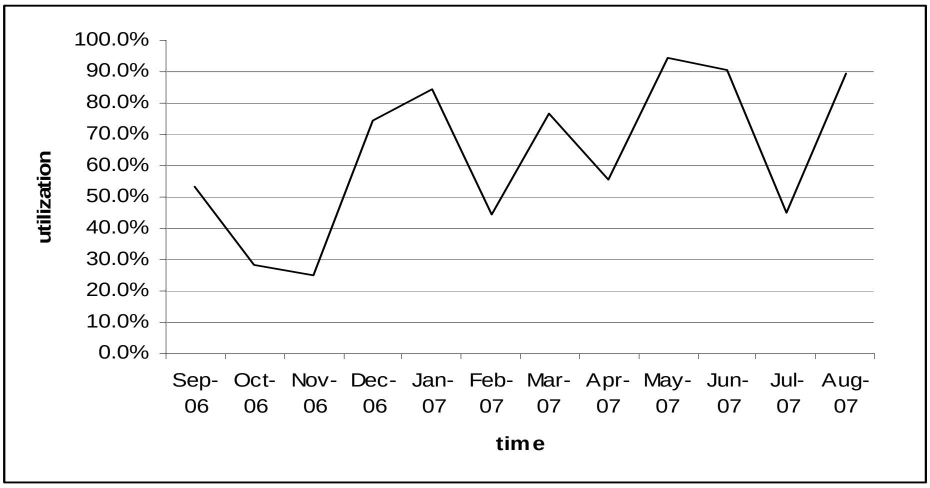
35 Lignite form the coal fields in Kutch district in which the project is located

36 Plant data from 1st year of 250 TPD sponge iron kiln operation

Jul-07	3393	17	250	7500	4250	45.2%	79.8%
Aug-07	6707	28	250	7500	7000	89.4%	95.8%
average	4768	24.1	250	7500	6021		
	57214	**289**	**3000**	**90000**	**72250**	**63.6%**	**79.2%**

Table B 5-1 shows the operational parameters of the kiln installed at the steel plant where the CDM project is implemented. It can be observed that the average capacity utilization of the kiln and thereby its power generation capacity is only 63.6%. This is very low as compared to thermal power stations which usually have a load factor of over 90%. The data in table B 5-1 also reflects the aforementioned discussions about variations in the waste heat availability. The lowest capacity utilization value was 25.2% and the highest was 94.5%. Such a wide variation demonstrates the uncertainty of waste heat availability and power generation potential from the waste heat recovery power plant. (see table B 5-2)

Table B. 5-2: Capacity Utilization of the kiln[37]



In addition to fluctuations in waste gas quantity, the kiln is only operational 289 days per year, as opposed to 330-350 days for a coal power station. In addition, the load factor of the WHR power plant (79%) is considerably lower when compared to coal (95%). Due to higher downtimes for maintenance and fluctuating waste heat availability the plant, the utilization factor varies considerably as compared to coal. Table B. 5-3. shows the unreliability of WHR power generation. By comparing the electricity output from WHR at different capacity utilization levels with coal it can be observed that the gap in electricity generation varies between 90,000 MWh and 0.6 MWh. This comparison demonstrates the large gap between the two options and the unpredictability of power output from WHR technology.

Table B. 5-3: Comparative electricity output

	coal	**WHR**				
capacity utilization[38]	95%	25.2%	44.3%	63.3%	78.9%	94.5%
net electricity (MWh)	123,120	32,659	57,348	82,037	102,254	122,472

37 Plant data from 1st year of 250 TPD sponge iron kiln operation

38 Assumed operational days of 360 per year

balance to coal (MWh)	**0**	**-90,461**	**-65,772**	**-41,083**	**-20,866**	**-648**

Given the technological risks and resulting financial disadvantages related to WHR technology, the project developer would not implement a WHR project which requires additional capital expenditure since he already has a coal based power station in the baseline.

Waste heat characteristics:

Nitrate stress corrosion cracking is another phenomenon that can result from the specific flue gas composition.[39] Thereby caused tube leakage requires the shutdown of the boiler for maintenance, decreasing utilization of the WHR boiler. High dust content of the waste heat also increases the downtime of the WHR boiler. Both effects decrease the utilization of the WHR boiler even below the above discussed utilization rate which only relates to the kiln operation but not to the operation and maintenance requirements of the boiler.

b) Common practice barriers

This project is the first of its kind in the state: it is the first WHR power plant at an iron and steel facility in the state of Gujarat. To the knowledge of the project developer there is one more sponge iron plant installing WHR technology which is proposed as a CDM project.[40]
Captive power plants in the steel industry have to date been based on fossil energy sources. Therefore, as demonstrated in the common practice analysis (step 4, below), the project faces a significant barrier due to prevailing practice. Gujarat is one of the largest sponge iron producing states in India, and there are approximately fifteen to twenty sponge iron facilities in the state, none of which currently have waste heat based captive power plants.

Considering the country as a whole, no reliable information about the success rate of WHR technology in the Indian steel sector is currently available to the project developer, which poses a considerable risk to the implementation of the proposed CDM project.

c) Other barriers

Labour availability:

Another danger to the project is the company's internal capacity to control and operate the power plant. The proper controlling of a WHR power system requires specific skills of the workforce who is handling the power plant.
General skills to operate a fossil fuel based power plant are not sufficient to operate a combined WHR and coal based power plant efficiently, due to the above mentioned technological challenges a WHR plant is confronted with. Specifically, the coordination of the fossil fuel feeding due to the fluctuating power generation from waste heat boilers requires specific skills of the workforce. A reduced power output might result from improper training and insufficient skills of the workforce handling the power plant.

39 Leferink, Huijbegrets, p. 118-126

40 http://www.dnv.com/certification/climatechange/Upload/CDM_PDD_Mono_Steel.pdf

The project developer has not operated WHR boilers previously. There is no experience available in the existing workforce of the project developer to maintain and operate a waste heat recovery based power generation system. Therefore new engineers have to be employed and training has to be provided by an external consultant in order to achieve the required performance and efficiency of power generation from waste heat sources. A training period of at least one year is necessary to enable the workforce to operate the plant properly and at its maximum efficiency.

Additional training will be provided by three external engineers for a period of approximately one year after commissioning of the first WHR boiler in January 2008. The engineering company HIQ Power Associates Ltd, which is the EPC contractor for the project, is providing six specialists for training of the staff in areas like civil, mechanics, electrics and instrumentation.

The lack of properly trained labour leads to a higher probability of damages to the equipment and underperformance of the power plant. In order to properly train labour, the project developer has to bear significant additional costs.

Finally, the skills of the workforce are a much more critical factor in the proper operation of the combined waste heat recovery and coal based power plant compared to a fossil fuel only based power plant due to the higher technological challenges involved as highlighted above. Therefore, the probability of underperformance of the power plant due to manpower related mistakes is much higher than it is for fossil fuel only based power plants.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives

The above discussed barriers affect the viability of the WHR recovery project. None of these barriers is applicable to the alternatives to the proposed CDM project, specifically to the selected baseline scenario, a coal based CPP. Therefore, the proposed WHR power plant is less attractive to the project developer as compared to the continuation of captive power generation using coal.

A fossil fuel based CPP does not face inconsistency of fuel supply and quality in the same levels as a WHR plant, it is not dependant on the operational parameters of a kiln, and does not have problems in finding properly skilled labour. Power generation from coal based boilers is more predictable since fuel feed rate, combustion air blow rate, temperature and pressure of the steam can be controlled and therefore the optimum heat rate and load factor can be achieved. A WHR power plant is dependant on the operational parameters of the kiln which vary considerably (see table 5.2). Due to the wide fluctuation of waste heat availability as well as more frequent boiler shutdowns for maintenance, the power generation potential of a WHR power plant is more unpredictable as compared to a coal based power plant. Since coal is easily available and not dependant on operational parameters of other processes the power generation from a coal based power plant can be determined in advance. Moreover, the heating potential of the coal used in the baseline is known whereas the heating potential of the waste heat depends on its quantity, temperature and pressure which vary according to the operational parameters of the underlying iron reduction process.

Due to the unpredictability and unreliability of waste heat power generation and therefore potential additional cost for coal as well as poor asset utilization, the project developer cannot accurately determine the project performance and the return from the investment. The project would not be feasible to implement without CDM financing.

Step 4. Common practice analysis

Sub-step 4a. Analyse other activities similar to the proposed project activity

The Central Electricity Authority (CEA) of India has published a study of captive power plants in India in 2005. In total, there are two hundred and eight captive power plants existing in India with a total installed capacity of 7,633 MW. Among these CPP's, only fourteen (6.7%) run on waste heat, waste gas or a mix between waste heat/gas and fossil fuels (there are 147 sponge iron plants in India (see below), therefore less than 10% of these plants have existing waste heat based captive power plants). The existing WHR plants amount to a total of 294 MW installed capacity (3.8% of the total captive power installed capacity in India).[41] As per this study, there is no existing captive power plant based on waste heat recovery in the State of Gujarat, even though Gujarat is with approximately 15 sponge iron plants the biggest sponge iron producing state in India and India is the largest sponge iron producer globally[42].

According to a study of the Joint Plant Committee, there are 147 existing sponge iron plants in India. Out of these, only 16 plants have a captive power generation facility (either fossil fuel or WHR)[43]. This represents an adoption of captive power generation technology in only 10.8% of all sponge iron plants in India. As per this study, there are no captive power generation facilities existing in the state of Gujarat, hence there are no captive power plants using waste heat operating in the state of Gujarat.[44]

A working paper published by Stanford University in 2004 investigates captive power plants in Gujarat state.[45] It is said that Gujarat state has a favourable regulatory environment for the installation of CPPs in the industrial sector. The market share of CPPs in the state is 22% as compared to the total installed capacity in Gujarat, which is very high in comparison to other states in the country. The study identifies 163 CPPs in Gujarat with a size larger than 5MW in capacity. These CPPs are installed in different industries including the steel industry. However, there was no CPP identified using waste heat as fuel source. Therefore it can be concluded that as per this study this project is the first waste heat powered captive power plant in the state, based on the most recent data available.

Sub-step 4b. Discuss any similar options that are occurring

The different studies mentioned above clearly demonstrate that energy generation from waste heat is not a common practice in Gujarat or in India as a whole. A few WHR based power plants have been implemented in the past few years, but these power plants are being realised as CDM projects.

Table B. 5.5. WHR power plants registered as CDM projects[46]

41 CEA: Report on Tapping of Surplus Power from Captive Power Plants

42 http://ic.gujarat.gov.in/major-events/news.html

43 Survey of Indian Sponge Iron Industry 2005-06, p.7

44 Survey of Indian Sponge Iron Industry 2005-06, p.38 (PDF file)

45 Captive Power Plants: Case Study of Gujarat, India

46 http://cdm.unfccc.int/Projects/index.html

	Company	Location
1	Godawari Power and Ispat Ltd.	Chattisgarh
2	Tata Sponge Iron Limited	Orissa
3	OCL India Limited	Orissa
4	Monnet Ispat Limited	Chattisgarh
5	Jai Balaji Sponge Limited	West Bengal
6	Vandana Global Limited	Chattisgarh
7	Shri Bajrang	Chattisgarh
8	Shree Nakoda	Chattisgarh
9	Orissa sponge iron ltd	Orissa
10	SKS Ispat Limited	Chattisgarh
11	Usha Martin Limited	Jharkhand
12	Rashmi Sponge Iron Pvt	Chattisgarh
13	Godawari Power and Ispat	Chattisgarh
14	MSP steel and power ltd	Chattisgarh
15	Ind Synergy Ltd	Chattisgarh
16	Sri Ramrupai Balaji Steel Limited	West Bengal
17	Nalwa Sponge Iron Limited	Chattisgarh
18	Gippl	Maharashtra
19	Gipl	Chattisgarh
20	Ramswarup Loh Udyog	West Bengal
21	Kamachi Sponge & Power Corporation Limited	Tramil Nadu

Apart from those registered CDM projects, several other WHR power plants are currently proposed as CDM projects. This demonstrates the increased uptake of waste heat recovery technology with the benefits of CDM financing, and helps reinforce the conclusion that in the absence of CDM financing, waste heat recovery for power generation is not common practice in the host country.

Summary

CDM revenues provide a secure long term source of revenues for the project in hard currency, mitigating the risks associated with investing in this type of project. Due to the high risks associated with waste heat recovery technology, the project developer was only able to take the decision to invest and go ahead with the project implementation after the additional revenues from CDM were considered.

The project activity would not happen in the absence of CDM funds since the project developer has the option to continue a more attractive alternative for power generation with a lower risk profile. CDM revenues compensate for the risks involved in WHR technology, enabling the project developer to implement the proposed CDM project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As per the Methodology ACM0012 / version 1, emission reductions from the project are equal to baseline emissions minus project emissions. No leakage emissions are applicable under this methodology.

Baseline Emissions:

As per the discussion in Section B.4, the baseline scenario is identified as the continuing supply of electricity from a coal based CPP. Given the large energy demand of a steel mill, even in the project scenario the coal captive power plant will not be completely shut down, and the project developer will still continue to produce electricity from a coal captive power plant, since the amount of electricity from the waste heat recovery plant is not sufficient to meet the energy demand. Therefore the project activity will reduce GHG emissions by displacing emissions from coal.

As per ACM0012, version 1, baseline emissions are given as:

$$BE\ (y) = BE\ en,\ y \qquad (1)$$

Where:

BE (y) = are total baseline emissions during the year *y* in tons of CO_2

BE en, y = are baseline emissions from energy generated by project activity during the year *y* in tons of CO_2

Note: since the waste gas is not flared in the baseline, *BE flst, y* (Baseline emissions from generation of steam, if any, using fossil fuel that would have been used for flaring the waste gas in absence of the project activity in tCO_2e per year) is not considered

Baseline emissions for scenario 1

In the case of the project activity, electricity is obtained from a specific existing power plant. Therefore:

$$BE\ en,\ y = BE\ elec,\ y \qquad (1a)$$

Where

BE elec, y = baseline emissions due to the displacement of electricity during the year *y* in tons of CO_2

Note: since the project activity is generating electricity only, *BE ther, y* (baseline emissions from thermal energy (due to steam and/or process heat) during the year *y* in tonnes of CO_2) is not considered

$$BE\ elec,y = f\ cap * f\ wg * \sum_j \sum_i ((EG\ i,j,y * EF\ elec,\ i,j,y\ )) \qquad (1a - 1)$$

Where:

f cap = Energy that would have been produced in project year y using waste heat generated in base year expressed as a fraction of total energy produced using waste heat in year y. The ratio is 1 if the waste heat generated in project year y is same or less then that generated in base year. The value is estimated using equation (1f) and (1f-1)

f wg = Fraction of total electricity generated by the project activity using waste heat. Since the steam used for generation of the electricity is produced in dedicated boilers but supplied through a common header, this factor is estimated using equation (1e).

EG i,j,y = is the quantity of electricity supplied to the recipient *j* by generators, which in the absence of the project activity would have been sourced from *i*-th source (the coal fired captive power plant) during the year *y* in MWh, and

EF elec, i,j,y = is the CO_2 emission factor for the electricity source i (i=is (identified source) = coal fired captive power plant), displaced due to the project activity, during the year *y* in tons CO_2/MWh

In this project, the baseline scenario is energy generation from a captive power plant, therefore the CO_2 emission factor shall be calculated as follows:

EF elec, is, j, y = (EF CO_2, is, j / η Plant j) * 0.0036 (1a – 11)

Where:

EF CO_2, is, j = is the CO_2 emission factor per unit of energy of the fossil fuel (coal) *used* in the baseline generation source *i* in (tCO_2 / TJ), obtained from IPCC default values

η Plant j = is the overall efficiency of the existing plant that would be used by j-th recipient in the absence of the project activity.

The efficiency (η Plant j) is assumed to be constant. It is determined ex-ante and used throughout the crediting period For the purpose of conservativeness, the highest value of a range for the boiler efficiency given by the manufacturer is taken and the generator efficiency is not considered to determine the overall efficiency.

Calculation of the energy generated in units supplied by waste gas and other fuels

The fraction of energy produced by the project activity is calculated based on 'situation 2' from methodology ACM0012, using equation 1.e, as follows. This method is applicable since all boilers provide superheated steam to the common header.

f_{wg} = $ST_{whr,y} / (ST_{whr,y} + ST_{other,y})$ (1e)

Where:

$ST_{whr,y}$ = Energy content of the steam generated in waste heat recovery boiler fed to turbine via common steam header (GJ)

$ST_{other,y}$ = Energy content of the steam generated in other boilers fed to turbine via common steam header (GJ)

Capping of baseline emissions

Since the project uses waste gas from newly built sponge iron kilns, data on waste gas released, flared or combusted for the past 3 years does not exist. Therefore method 2 from methodology ACM0012 is used to estimate the cap on baseline emissions. f cap is estimated using equations 1.f and 1.f-1:

f_{cap} = Q (WG, BL) / Q (WG, y) (1f)

Where:

Q (WG, BL) = Quantity of waste gas that will most likely be generated by the two proposed kilns (250TPH and 350TPH)
estimated using equation 1f-1. (Nm3)

Q (WG, y) = Quantity of waste gas used for energy generation during year y (Nm3).

Q (WG, BL) = Q (BL, product) * q (wg, product) (1f-1)

Where

Q (BL, product) = Production by process that most logically relates to waste gas generation in baseline. This is estimated using the stated capacity of the two kilns as per the manufacturer's specification.

q (wg,product) = Amount of waste heat the industrial facility generates per unit of product generated by the process that generates waste heat. This is estimated as per the manufacturer's specification.

Project emissions:

Emissions from fossil fuel or electricity used to provide supplementary heat and for gas cleaning will be accounted for as Project Emissions.

PE_y	=	$PE_{AF,y} + PE_{EL,y}$	(tCO2)	(2)
where				
PE_y	=	Project Emissions due to the project activity	(tCO2)	
$PE_{AF,y}$	=	Project Emissions from on-site consumption of auxiliary fossil fuel	(tCO2)	
$PE_{EL,y}$	=	Project Emissions from on-site consumption of electricity	(tCO2)	

$PE_{AF,y}$	=	$\sum FF_{i,y} * NCV_i * EF_{CO2,i}$		(2a)
where				
$PE_{AF,y}$	=	Project Emissions from on-site consumption of auxiliary fossil fuel	(tCO2)	
$FF_{i,y}$	=	quantity of fossil fuel type *i* combusted to supplement waste heat in the project activity during the year *y*	(t)	
NCV_i	=	net calorific value of the fossil fuel type *i* combusted as supplementary fuel	(TJ/t)	
$EF_{CO2,i}$	=	CO_2 emission factor per unit of energy	(t CO2 / TJ)	

$PE_{EL,y}$	=	$EC_{PJ,y} * EF_{CO2,EL,y}$	(tCO2)	(2b)
where				
$EC_{PJ,y}$	=	Additional electricity consumed in year y as a result of the implementation of the project activity	(tCO2)	
$EF_{CO2,EL,y}$	=	CO2 emission factor for electricity consumed by the project (activity in year y (default EF of 1.3tCO2e/MWh will be used)	(tCO2/Mwh)	

Emission Reductions

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

ER y = BE y – PE y

Where:

ER y = are the total emissions reductions during the year *y* in tons of CO_2

BE y = Baseline emissions from the project activity during the year *y* in tons of CO_2

PE y = Project emissions for the project activity during the year *y* in tons of CO_2

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

Data / Parameter:	$EF_{CO2, EL, y}$
Data unit:	tCO_2 / MWh
Description:	CO_2 emission factor for electricity consumed by the project activity
Source of data to be used:	Default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1.3 t CO_2 / MWh
Description of measurement methods and procedures to be applied:	Annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	η Plant j
Data unit:	%
Description:	Baseline efficiency of the captive power plant
Source of data used:	Manufacturer's data
Value applied:	26.87 % Boiler: 84% Turbine: 31.89%
Justification of the	The efficiency (η Plant j) is assumed to be constant It is determined ex-ante and

choice of data or description of measurement methods and procedures actually applied:	used throughout the crediting period. For the purpose of conservativeness, the highest value of a range for the boiler efficiency given by the manufacturer is taken and the generator efficiency is not considered to determine the overall efficiency. The efficiency is calculated based on the boiler efficiency and turbine heat rate (2688.3 kcal/kwh) both obtained from the manufacturer. The energy available after energy loss due to boiler and turbine inefficiency is put into relation with the energy input into the boiler (energy input of coal: IPCC 2006 default value 0.0287 TJ/t fuel * 277.7778 MWh/TJ): boiler input energy (energy content of coal) mwh/t — **7.83**[47] mwh/t boiler efficiency — 84% % energy available after boiler — 6.57 mwh/t conversion factor to kcal — 859,845.2 mwh/kcal turbine input energy kcal/t — 5,653,404 kcal/t turbine heat rate — 2688.3 kcal/kwh energy available after boiler and turbine — 2,103 kwh/t **2.10** mwh/t overall plant efficiency — 26.87%
Any comment:	

Data / Parameter:	Q WG,BL
Data unit:	(Nm 3)
Description:	Quantity of waste gas generated prior to the start of the project activity.
Source of data used:	According to manufacturer's specifications.
Value applied:	1,330,560,000 Nm3/yr
Justification of the choice of data or description of measurement methods and procedures actually applied:	It is determined using equation 1f-1.
Any comment:	Since there is no historic data available, the potential quantity of waste heat is determined on the basis of specifications from the manufacturer regarding the average waste heat generation as well as the kiln capacity. This value is an estimate of the potential waste heat generation from the process that most logically relates to the waste heat generation.

Data / Parameter:	Q BL, Product
Data unit:	t
Description:	Output of the production process which most logically relates to waste heat generation in the baseline. This is estimated based on manufacturer's

47 IPCC 2006 default value for coal: 0.0287TJ/t * 277.7778 Mwh/TJ

	specifications for two sponge iron kilns
Source of data used:	Calculated
Value applied:	198,000 tonnes per year
Justification of the choice of data or description of measurement methods and procedures actually applied:	Value is determined as the potential output quantity of the production process which most logically relates to waste heat generation in the baseline.
Any comment:	Since no historical data for both kilns is available for Q BL, the value for Q BL is fixed at the maximum potential sponge iron production output of the kilns as per the rated capacity of the kiln, obtained from the technology specification.

Data / Parameter:	q wg, product
Data unit:	Nm3/Ton
Description:	Specific waste heat production per unit of product (plant product which most logically relates to waste heat generation) generated as per manufacturer's data. This parameter should be analysed for each modification of the process which can potentially impact the waste heat quantity. (Nm3/Ton)
Source of data used:	Manufacturer's specification
Value applied:	6,720 Nm3/t
Justification of the choice of data or description of measurement methods and procedures actually applied:	It is determined based on information provided by the technology supplier on the average waste heat generation from the kilns
Any comment:	Value is estimated using the manufacturer data: Q WG BL: 1,330,560,000 Nm3/yr Q BL, Product: 198,000 t/yr

B.6.3 Ex-ante calculation of emission reductions:

The ex-ante emission reduction calculations are as follows:

ER (y) = BE (y) – PE (y)

Where:

ER: Emission reductions (t CO_2e)

BE: Baseline emissions (t CO_2e)

PE: Project Emissions (t CO_2e)

y: a given year

Step 1. Calculate baseline and project emissions

As per the project participants calculation, the expected annual net electricity displaced by the project activity will be 79,571MWh, and the baseline emissions will be calculated as per the methodology described in section B 6.1 above, thus,

$BE_{elec,y} = f_{cap} * f_{wg} * \Sigma\Sigma ((EG_{i,j,y} * EF_{elec,i,j,y}))$

$= 1 \times 0.3823 \times 79{,}571 MWh \times 1.27\ tCO_2/MWh$

$= 100{,}843\ tCO2e$

$PE_y = EC_{PJ,y} * EF_{CO2,EL,y} + FF_{i,y} * NCV_i * EF_{CO2,i}$

$= 2{,}081\ MWh \times 1.3\ tCO_2/MWh + 0\ t \times 25.9\ TJ/t \times 94.6\ tCO2/TJ$

$= 2{,}706\ tCO2e$

Step2. Estimation of emission reductions (ERy)

Emission reductions are equal to baseline emissions minus project emissions:

$ER_y = BE_y - PE_y = 100{,}843 – 2{,}706 = 98{,}137\ tCO2e$

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_2 e)	Estimation of Emission reductions (tonnes of CO_2e)
2008	1,759	65,548	63,789
2009	2,706	100,843	98,137
2010	2,706	100,843	98,137
2011	2,706	100,843	98,137
2012	2,706	100,843	98,137
2013	2,706	100,843	98,137
2014	2,706	100,843	98,137
Total	**17,994**	**670,608**	**652,614**

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

The project uses the monitoring methodology described in AMC0012, version 1, EB32.

B.7.1 Data and parameters monitored:

Capping of baseline emissions:

Data / Parameter:	Q wg, y
Data unit:	Nm^3
Description:	Quantity of waste heat used for energy generation during year y (Nm 3)
Source of data to be used:	plant data measurement records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,330,560,000
Description of measurement methods and procedures to be applied:	Direct continuous measurements by project participants through an appropriate metering device (e.g. turbine flow meter).
QA/QC procedures to be applied:	Measuring equipment should be calibrated on regularly. During the time of calibration and maintenance, alternative equipment should be used for monitoring.
Any comment:	

Baseline emissions

Data / Parameter:	EFelec,i,j,y
Data unit:	tCO_2 / MWh
Description:	CO_2 emission factor for the electricity source i, displaced due to the project activity, during the year *y* in tons CO_2/MWh
Source of data to be used:	Project participants calculation sheets
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1.27 t CO_2 / MWh
Description of measurement methods and procedures to be applied:	Annually Calculated as weighted average emission factor of the baseline electricity source using EF f (f1,…fx) and relative quantities (rq, k) of the baseline fuel sources rq, f = relative quantities of the baseline fuel sources f1….fx in the year y Measurement of the volume of all fuel types k used in the baseline generation

	source during year y, Project participant fuel consumption records. Data used to determine **EFelec,i,j,y:** rq, f1 = 100%
QA/QC procedures to be applied:	
Any comment:	For identified sources (is), equation (1a-11) of the methodology is used.

Data / Parameter:	**$EFCO_2$,is,j**
Data unit:	t CO_2 / TJ
Description:	CO_2 emission factor per unit of energy of the fossil fuel used in the baseline generation source i (i=is) providing energy to recipient j.
Source of data to be used:	IPCC 2006 default values
Value of data applied for the purpose of calculating expected emission reductions in section B.5	f1 = 94.6
Description of measurement methods and procedures to be applied:	Annual cross check with latest IPCC values for all fuel types f used in the baseline generation source (= captive power plant)
QA/QC procedures to be applied:	No QA/QC necessary for this data item
Any comment:	Emission factor for coal char is calculated based on the measured carbon content

Data / Parameter:	**EG i,j,*y***
Data unit:	MWh
Description:	Quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have sourced from *i*- th source (*i* is the identified source) during the year *y* in MWh
Source of data to be used:	Recipient plant(s) and generation plant measurement records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	208,141
Description of measurement methods and procedures to be applied:	Electricity will be measured with an electricity meter and data will be recorded monthly
QA/QC procedures to be applied:	The energy meters will undergo maintenance / calibration to the industry standards. The methodology requires sales records and purchase receipts to be ensure consistency of the data monitored. This is not applicable since the

	project is a captive power plant. To ensure consistency, the data will be cross-checked with fossil fuel consumption as well as sponge iron production output.
Any comment:	Data shall be measured at the recipient plant(s) and at the generation plant for cross check.

Fraction of electricity generated from WHR

Data / Parameter:	**STwhr,y**
Data unit:	kJ/kg
Description:	Energy content of the steam generated in waste heat recovery boiler fed to turbine via common steam header
Source of data to beused:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	350,684 t / year Steam energy from WHR boiler assumed to be 38.2% of total steam energy Q steam (coal boiler): 566,630 tons per year Q steam (WHR boiler): 350,684 tons per year Assumed 79% WHR boiler load factor = 51 TPA from WHR over 289 days Coal boiler capacity 120 TPH – 51 TPA = 69 TPA from coal over 340 days 120 TPA required for 30 MW energy generation capacity
Description of measurement methods and procedures to be applied:	Energy content will be calculated on the basis of monitored steam flow, temperature and pressure using steam tables.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	**ST (other), y**
Data unit:	kJ/kg
Description:	Energy content of the steam generated in other boilers fed to turbine via common steam header
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	566,630 t/year
Description of measurement methods and procedures to be applied:	Energy content will be calculated on the basis of monitored steam flow, temperature and pressure using steam tables.
QA/QC procedures to	

be applied:	
Any comment:	

Project Emissions

Data / Parameter:	EC $_{PJ, y}$
Data unit:	MWh
Description:	Additional electricity consumed in year y as a result of the implementation of the project activity
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2,081
Description of measurement methods and procedures to be applied:	Electricity will be measured continuously and data will be recorded monthly
QA/QC procedures:	
Any comment:	Electricity meter will undergo regular maintenance and calibration.

Data / Parameter:	FF $_{i, y}$
Data unit:	T
Description:	Quantity of the fossil fuel type *i* combusted to supplement waste heat in the project activity during the year *y*, in mass units
Source of data to be used:	Measurement records of recipient plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Continuously and aggregated monthly
QA/QC procedures:	Fuel flow meters will undergo maintenance / calibration subject to appropriate industry standards. Records of measuring devices shall ensure the data consistency. Fuel purchase records / receipts by recipient plants shall be used to verify the measured data.
Any comment:	This data item is measured in mass units. The project is not expected to use any fossil fuels to supplement the waste gas

Data / Parameter:	NCV i
Data unit:	TJ/t

Description:	Net Calorific Value of the fossil fuel type *i* combusted to supplement waste heat in the project activity during the year *y*
Source of data to be used:	project specific data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	25.96
Description of measurement methods and procedures to be applied:	annually
QA/QC procedures:	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.

Data / Parameter:	$EF_{co2,\,i}$
Data unit:	tCO2/TJ
Description:	CO2 emission factor per unit of energy of the fossil fuel type *i* combusted to supplement waste heat in the project activity during the year *y*
Source of data to be used:	IPCC 2006 default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	94.6
Description of measurement methods and procedures to be applied:	Annual cross check with latest IPCC values
QA/QC procedures:	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:

This section details the steps taken to monitor on a regular basis the GHG emission reductions from the Electrotherm 30MW waste heat recovery based power project in India.

The Monitoring Plan for this project has been developed to ensure that from the start, the project is well organised in terms of the collection and archiving of complete and reliable data.

Prior to the start of the crediting period, the organisation of the monitoring team will be established. Clear roles and responsibilities will be assigned to all staff involved in the CDM project and a single CDM Manager will be nominated. The CDM Manager will have the overall responsibility for the monitoring system on this project.

A formal set of monitoring procedures will be established prior to the start of the project. These procedures will detail the organisation, control and steps required for certain key monitoring system features, including:

a) CDM staff training
b) CDM data and record keeping arrangements
c) Data collection
d) CDM data quality control and quality assurance
e) Equipment maintenance
f) Equipment calibration
g) Equipment failure

See Annex 4 for a description and the scope of these procedures

The CDM Manager will be responsible for ensuring that the procedures are followed on site and for continuously improving the procedures to ensure a reliable monitoring system is established.

All staff involved in the CDM project will receive relevant training laid down in training procedures. Records of trained CDM staff will be retained by the Project Developer. The CDM Manager will ensure that only trained staff are involved in the operation of the monitoring system.

Metering of Electricity from waste heat recovery supplied to the steel plant

The main electricity meter for establishing the total electricity delivered to the steel plant (detailed in B.7.1) will be installed at the main control room. In order to determine the portion of electricity generated from the waste heat recovery boilers, the energy content of WHR-steam as well as of FBC-steam will be monitored.

The steam flow meters are located in between the coal/WHR boilers and the common steam header. Temperature and pressure are monitored before the steam enters into the common steam header. Steam flow, temperature and pressure are monitored continuously by the distributed control system (DCS).

The CDM Manger of the project developer is responsible for checking the data (according to a formal procedure) and will also be responsible for managing the collection, storage and archiving of all data and records. A procedure will be developed to manage the CDM record keeping arrangements.

All the data shall be kept until two years after the end of the crediting period.

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)

The baseline study and the monitoring methodology were concluded on 01 October 2007. The entity determining the baseline study and the monitoring methodology and participating in the project as the Carbon Advisor is EcoSecurities Group PLC, listed in Annex 1 of this document as a project participant.

Contact: henning.thiel@ecosecurities.com

Detailed baseline information is attached in Annex 3.

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 May 2006

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

More than 20 years

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

C.2.1. Renewable crediting period

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

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

The crediting period will start on 01 January 2008 or the date of registration, whichever is later

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

The project is not expected to create severe environmental impacts, and an EIA is not required for the establishment of the power plant.

The Project Developer requires an approval for installation for the power plant from the Pollution Control Board. This approval will be recorded and provided at the time of validation.

As mentioned, the plant will have an electrostatic precipitator which is also part of the baseline and this will limit particle emissions to less than 150mg/Nm3. Particle emissions will therefore meet the regulations governing air pollution (Air Prevention and Control of Pollution Act, 1981). There is no water pollution associated with the plant as water will only be used for indirect cooling.

The project developer has undertaken a rapid impact assessment study in order to identify any possible environmental impacts of the project activity. The study did not identify any adverse impacts resulting from 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:

As highlighted above environmental impacts are not considered significant and the plant will meet all local and national environmental policies and standards. There is only noise pollution occurring in the area where the turbine is located. Noise protection will be provided to the workforce that is affected.
With mitigation controls planned as part of the project design, construction and operation, and the contribution made by the project to sustainable development at local and national scale, the project is expected to have an overall positive impact on the local and global environment.

SECTION E. Stakeholders' comments

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

According to national legislation, all CDM projects must carry out a stakeholder consultation which includes inviting key local stakeholders to provide comments. These comments must be taken into account in the design and operation of any project.

The project developer has published an advertisement in 2 local newspapers in order to inform a wide range of local stakeholders and invite their comments on the project. One advertisement was placed in English language in 'The Times of India', Ahmedabad issue on 19 February 2007; a second advertisement was placed in 'Divya Bhaskar' in Gujarati, the local language on 19 February 2007.

In addition, the project developer has identified 14 parties (see table below) from the government and private sectors, and from the steel and power industries as well as from the local population. Those stakeholders were informed about the CDM project by a letter describing the project and its related impacts on the environment and invited them to give their comments about the project. A questionnaire was attached to those letters, asking specific questions about the impact of the CDM project on the socio-economic environment and living quality of affected people.

Table E-1: List of identified local stakeholders

SN	Name of Party & Address
1	Mr. Shri Babubhai Meghji Shah
2	Mr. Subhash Golchha Hon. Gen. Secretary

	Kutch Iron & Steel Association
3	Mr. SB Raval, Managing Director M/s Paschim Gujarat Vij Co. Ltd,
4	Mr. Nimish Phakdey Hon. General Sec. Federation of Kutch Industries Association
5	Mr.M. Ozat, Village Mamlatdar,
6	Mr. CL Meena, Pollution Control Board Guajrat,
7	Mr. Shri Jashvant Acharya Director, Gujarat Energy Development Agency,
8	Smt. Vijayalaxmi Joshi, IAS (CMD), Gujarat Urja Vikas Nigam Ltd,
9	Mr. SK Negi (MD), Gujarat Energy Transmission Corporation Ltd,
10	Mr. Kanjhi, Local Villager, Kutch, Gujarat, INDIA.
11	Mr. Chnnaram, Sarpanch, Gram Panchayat,
12	Mr. Patel, Gram Panchayat, Village : Secretary (Talati)
13	Indian Renewable Energy, New Delhi. India Habitat Centre Complex,
14	Ms. G. Subba Rao, Gujarat Energy Regulatory Commission,

All stakeholders were given a 30 days period to submit their comments.

E.2. Summary of the comments received:

The project developer received back 7 filled questionnaires out of 14 distributed. The project developer made an evaluation of the replies in order to understand the stakeholders' opinion and to address possible negative comments. It was found that the answers to the respective questions indicate that there are no concerns from the local stakeholders towards the socio-economic as well as ecological impacts of the CDM project and that all stakeholders support such clean technology projects.

Another 2 stakeholders submitted their comments in response to the newspaper advertisement published by the project developer. Mr. Patel and Mr. Purohit both welcome the CDM project as it contributes in their opinion to better environmental standards.

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

Mr. Patel asked for more details of the CDM project and a draft PDD was sent to him on 3 March 2007.

In conclusion, the local stakeholder consultation was very successful since its result was that no local people will be affected in a negative manner by the implementation and operation of the CDM project. Rather than that, local stakeholders are convinced that such projects contribute to a better socio-economic environment. No objection was expressed by any of the stakeholders of the project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Electrotherm India Ltd.
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Represented by:	COO & President
Title:	Dr.
Salutation:	Sir.
Last Name:	Costa
Middle Name:	Moura
First Name:	Pedro
Department:	
Mobile:	

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Personal E-Mail:	cdm@ecosecurities.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the proposed project.

Annex 3

BASELINE INFORMATION

Default			
EF (coal)	=	25.8	t C / TJ
coal CPP			
Eff (cpp)	=	26.78	%
load factor	=	95%	%
internal consumption	=	10.5%	%
Waste Gas			
Q WG 1 (h)	=	72,000	Nm 3 / h
Q WG 2 (h)	=	96,000	Nm 3 / h
Q product BL	=	198,000	t/a
Q product y	=	198,000	t/a
q product	=	6,720	NM3/t
Q wg (bl)	=	1,330,560,000	Nm 3 /yr
Q wg (Y)	=	1,330,560,000	Nm 3 /yr
CDM			
EG total supplied (y)	=	208,141	MWh / a
EG total supplied (y) WG	=	79,571	MWh / a
EG total supplied (y) FBC	=	128,570	MWh / a
% WHR energy	=	38.2	%
lf whrb	=	79%	%
ST whr / h	=	51	t / h
ST coal / h	=	69	t / h
ST whr (load)	=	289	days
ST coal (load)	=	340	days
ST whr / y	=	350,684	t / a
ST coal / y	=	566,630	t / a

BE		**100,843**	
baseline emission factor		**1.27**	**1a-11**
EF coal	=	25.8	t C / TJ
EF coal	=	94.6	t CO2 / TJ
EF coal	=	0.34	t CO2 / MWH
C to CO2	=	3.67	
TJ to MWh	=	277.8	
Eff (coal cpp)	=	26.87%	%
% WHR steam		**38.23%**	**1e**
ST whr / y	=	350,684	t/a

ST coal / y	=	566,630	t/a
cap		**1.00**	**1f**
Q wg (bl)	=	1,330,560,000	Nm 3 / a
Q wg (Y)	=	1,330,560,000	Nm 3 / a
cap		**1,330,560,000**	**1f-1**
Q bl, product	=	198,000	t/a
q wg, product	=	6,720	Nm 3 / t
EG total		**208,141**	
capacity	=	30	MW
days	=	8,160	h / a
LF	=	95%	%
Gross	=	232,560	Mwh
IC	=	10.5%	%
Net	=	208,141	Mwh

Annex 4

MONITORING INFORMATION

CDM Monitoring System Procedures

Procedure name	Description
CDM Staff training	This procedure outlines the steps to ensure that staff receives adequate training to collect and archive complete and accurate data necessary for CDM monitoring.
CDM data and record keeping arrangements	This procedure provides details of the sites data and record keeping arrangements. The arrangements ensure that complete and accurate records are retained by the CDM Manager within the quality control system. Data and records will be stored and archived according to this procedure.
Data collection	This procedure will outline the steps to collect the data from the monitoring equipment.
CDM data quality control and quality assurance	Data and records will be checked prior to being stored and archived. Data from the project will be checked to identify possible errors or omissions.
Equipment maintenance	This procedure outlines the steps to provide regular and preventative maintenance to the monitoring equipment
Equipment calibration	This procedure details the process of organising and managing the calibration process.
Equipment failure	This procedure details the process of data collection in the case that a problem with the monitoring equipment occurs.

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