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:

>>
Waste Heat Recovery based Captive Power Project based at KSPL
Version-01
20/01/2007

A.2. Description of the project activity:

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Kohinoor Steel Pvt. Ltd. (KSPL) is proposing to install a 10MW Captive Power Plant (CPP) for generation of electricity by utilizing sensible heat of waste gases emanating from the Direct Reduction Kiln.

KSPL is in the process of setting up a 400TPD sponge iron unit with 4 DRI Kilns of 100 TPD each. Each 100 TPD capacity DRI Kiln emits around 24,000 NM^3/hour of hot gas at a temperature of 950°C±50°C, containing heat energy to the tune of 8.2 Mkcal/hour which, under normal circumstances would go as waste. The project proposes to use the waste heat by installing Waste Heat Recovery Boiler at the tail end of each DRI Kiln. Heat that is extracted from the hot gas is used to transform water to high temperature-high pressure steam. This steam is used to run conventional condensing type steam turbo-generator (with steam dumping facility) for the generation of electricity.

Of the 17 MW installed capacity of the CPP, about 10MW of power will be generated through 4 Waste Heat Recovery Boilers capable of generating 2.5 MW of power each. The total heat energy available from the waste gas of DRI kiln, on conversion to electrical energy produces about 2.50 MW of electrical power per 100 TPD kiln. Harnessing this power by establishing a suitably designed Captive Power Plant at the tail end of the DRI Kiln will enable KSPL to reduce green gas emission by generating power from waste gas / heat.

The proposed plant of 10 MW is expected to be configured with 4 numbers of Waste Heat Recovery Boilers (WHRB) of capacity 10 TPH each, operating at 67 kg/cm^2 and 485±5°C and capable of generating 2.5 MW of power.

The common practice in sponge iron units for meeting the energy requirements of its plants is to either produce the same in a coal-based power generation plant or import electricity from the state grid. In the absence of the project, the KSPL would have resorted to the above-mentioned ubiquitous practice. In view of the same, the proposed project will displace an equal amount of imported electricity from the state grid / generated by a coal based power plant.

The main objectives of the project are:

- To achieve energy efficiency by utilizing the available waste heat from the waste gases of sponge iron kiln, thus promoting cleaner and more efficient technologies;
- Conservation of energy and natural resources, to reduce direct and indirect consumption of scarce resources;
- Environmental improvements in sponge iron making process as well as reduction in Greenhouse Gases (GHG) emission;

- The GHG emission reductions due to the project activity are equivalent to that quantity which would have been emitted from the combustion of a mixture of fossil fuels to produce the requisite electricity for the state grid.

Project's Contribution to the Sustainable Development

Social well-being: The project is expected to create significant employment opportunities (directly, by way of manpower required to build / operate / maintain the unit and indirectly, by generating power and thus eliminating the need to draw power from an already deficit grid). Further, with growing technological advancement, the project activity contributes to the capacity building in terms of technical knowledge and long-term skills. Such project, which involves energy efficiency, will certainly have long-term direct and indirect social benefits. The implementation of the project activity will bring about an increase in the business opportunities for contractors, suppliers, and erectors at different phases of its implementation. This will improve the local economic structure and hence social status of the involved people.

Economic well-being: The project will reduce the load on an already deficit electricity grid. By utilising waste energy, this project will replace an equivalent amount of electricity from the grid. In addition, the generation of employment opportunities also promotes the Economic well-being of the region.

Environmental well-being: In India, a major share of the country's electricity is generated from fossil fuel sources such as coal, diesel, furnace oil etc. The proposed waste heat recovery CDM project will displace or replace the equivalent quantity of electricity generated in the grid. Furthermore, the project will relieve the burden on the depleting resources of conventional fuel and hence increasing its availability to the other important processes. Since the project is able to avoid all the associated pollution occurring related to extraction, processing and transportation of natural resources, it promotes an overall environmental well-being.

Technological well-being: Waste Heat Recovery based captive power plant is a cleaner technology that uses the waste flue gases of sponge iron kilns which otherwise would have been emitted to the atmosphere leading to its pollution. The electricity generated by the plant is consumed for both auxiliary and captive purposes. Hence, the project activity has contributed to a better quality environment to the employees and the surrounding community.

A.3. Project participants:

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Name of Party involved (*) ((Host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ministry of Environment and Forest, Government of India (Host Country)	Kohinoor Steel Pvt. Ltd (Private Entity, Project participant)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

>> India

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

>> Jharkhand State

A.4.1.3. City/Town/Community etc:

>> Saraikela Kharsavan District, Kuchidih Village

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

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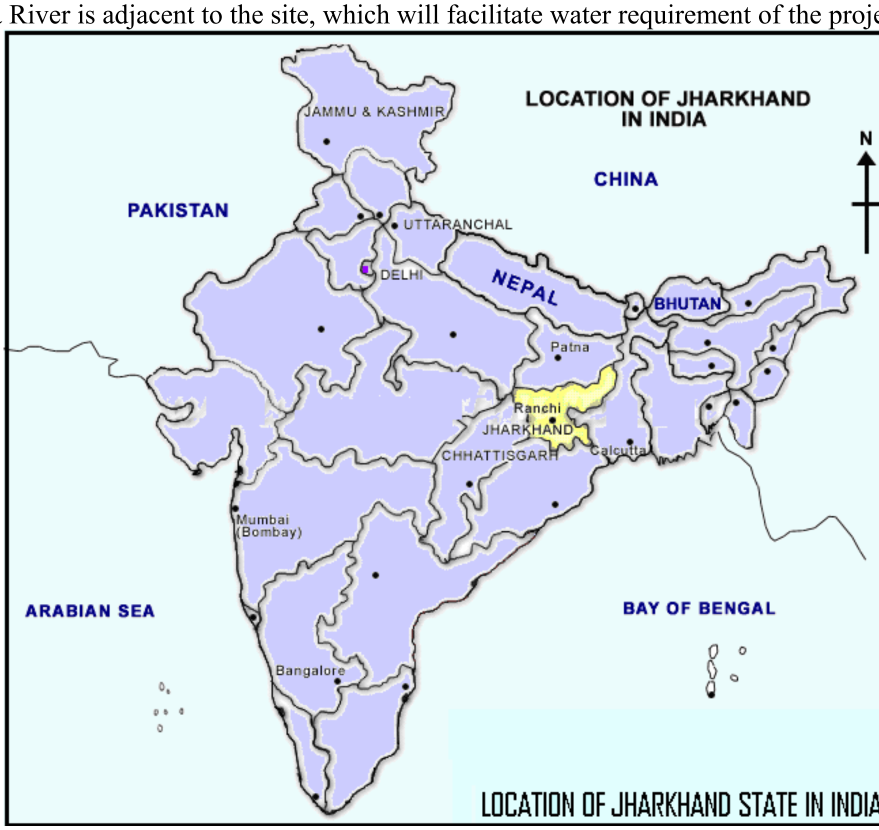
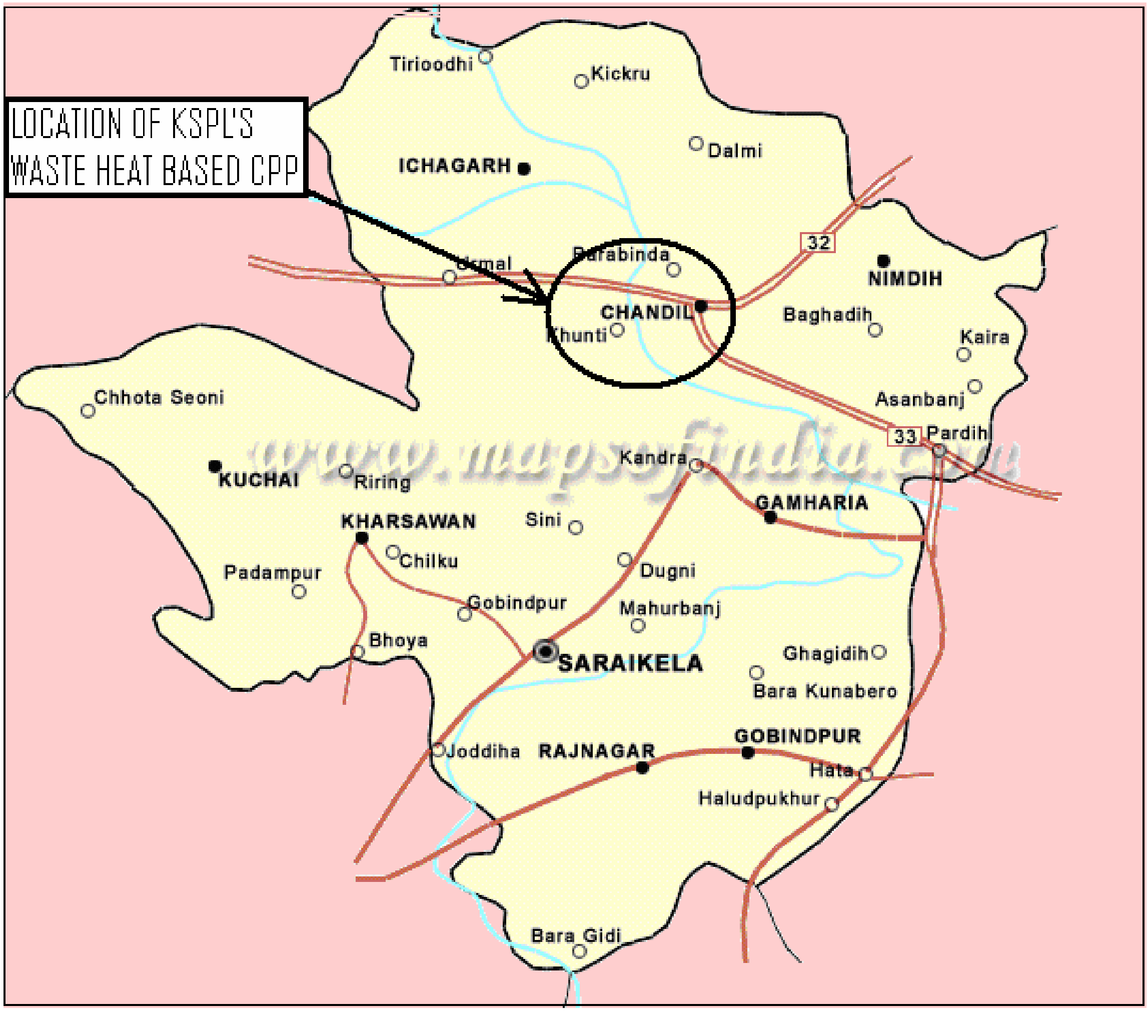
The project KSPL is located at Kuchidih village, P.S.Chandil, Saraikela Kharsavan District, Jharkhand. The site is only 25 Kms from steel city of Jamshedpur and 112 Kms from state capital Ranchi. The plant site is in close proximity with N.H. 33 and state highways. It is accessible by good motorable road. Swarnarekha River is adjacent to the site, which will facilitate water requirement of the project.





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

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The project activity is categorized under Sectoral Scope 01 "Energy Industries" (renewable / non-renewable sources). The project will be generating electricity by utilizing the waste gases from the sponge iron kiln. Thus, the approved methodology ACM0004 / Version02 is applicable to the project.

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

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The Waste Heat Recovery based Captive Power Plant equipped with modern equipments, utilizes the heat content of the waste flue gas from Direct Reduced Iron (DRI) kilns of sponge iron unit to generate electricity for captive consumption of KSPL.

KSPL is setting up a 400 TPD sponge iron unit with 4 DRI Kilns of 100TPD each. The exhausted flue gas of the sponge iron kiln enters the ABC inlet. The waste gases are then burnt in ABC to remove traces of carbon monoxide. After secondary combustion the hot flue gases leave the ABC that is finally introduced to the WHRB through a hot gas duct. Each DRI Kiln emits around 24,000 NM^3/hour of hot gas at a temperature of 950°C±50°C that contains heat energy to the tune of 8.2 Mkcal/hour which, if not suitably utilized, goes to waste.

Such energy waste could be abated by installing Waste Heat Recovery Boiler at the tail end of each DRI Kiln, which in fact works as a cooler for the high temperature gas. The heat extracted from the hot gases is utilized for transforming water to high temperature-high pressure steam, to run conventional condensing type steam turbo-generator for generation of electricity as a part of forward and backward integration process.

The gross heat energy that would be available from the hot gases at the boiler front has been estimated to be 32.8 Mkcal/hr. Thus, the total heat energy available from the waste gas of each 100 TPD DRI Kiln, on conversion to electrical energy generates approximately 2.50 MW of electrical power. The proposed plant shall be configured with 4 numbers of Waste Heat Recovery Boilers (WHRB) of capacity 10 TPH each, operating at 67 kg/cm^2 and 485±5°C, thus generating total power of 10MW.

The steam produced by the boilers will be routed to the 17 MW horizontal, single cylinder, single uncontrolled extraction condensing type steam turbine. The turbine is designed for main steam parameters of 64 ata 480°C to generate 17MW at generator terminal. The power plant power cycle is designed with one common de-aerator. The steam requirements for the de-aerator will be taken from the extraction of the turbine. The low-pressure extraction will meet with the de-aerator steam requirements.

The WHRB shall be sized and designed to extract maximum sensible heat energy contained in the waste gases emanating from the Direct Reduction Kiln. The major technical parameters of WHRB are given below:

1. The steam generator consists of membrane type radiant chamber, super heater, evaporator and economiser.
2. Pressure parts
   The complete system of boiler pressure parts, covering:
   - Steam drums
   - Water wall / radiant chamber
   - Evaporator
   - Super-heater
   - Economiser
   - Integral piping, interconnecting piping, valves, fittings, supports, etc. will be provided together with all the required headers.
   - The circulating system, essentially comprising of the drums, water walls etc, will be designed to provide an adequate circulation ratio. The sizing of the circulation system components will be adequate to ensure safe circulation ratios even under peak loading conditions.

The electricity requirements of the project activity and its associated systems are met by the project activity itself.

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

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The total emissions reductions throughout the first crediting period (7 years) from the project are expected to be as under:

Years	Annual estimation of emission reductions in tonnes of CO2 e
August 2006	23,406
2007	56,176
2008	56,176
2009	56,176
2010	56,176
2011	56,176
2012	56,176
Jan 2013 – July 2013	32,770
Total estimated reductions for the first crediting period	**393,265**
Total number of crediting years	**21y-0m (7 x3)**
Annual average over the first crediting period of estimated reductions (tones of CO2 e)	56,176

A.4.5. Public funding of the project activity:

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No public funding is involved in the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

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

Reference: Approved Consolidated baseline methodology ACM0004 / Version02 – Sectoral Scope: 01, 3rd March 2006.

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

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As stated in the "Consolidated baseline methodology for waste gas and/or heat for power generation"- **"This methodology applies to project activities that generate electricity from waste heat or the combustion of waste gases in industrial facilities".** The project activity under consideration recovers the heat content of waste gases emitted from the DRI kilns in WHRB and utilizes the same to produce steam which is further used to generate electricity.

Apart from the key applicability criteria, the project activity is required to meet the following conditions in order to apply the baseline methodology- "**The methodology applies to electricity generation project activities:"**

"That displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels,"- As per the Baseline Scenario analysis, conducted in Section B.4 of this PDD, the project activity displaces electricity generation with fossil fuels in the electricity grid (Eastern Regional Grid). Therefore the project activity meets this applicability criterion.

"Where no fuel switch is done in the process, where the waste heat or the waste gas is produced, after the implementation of the project activity"- The project activity involves utilization of the heat content of waste gases of the sponge iron kiln. There is no fuel switch involved in the sponge iron kiln operation.

Furthermore, **"The methodology covers both new and existing facilities"-** KSPL is installing a CPP at the tail end of 4DRI kilns which will enable to generate power from waste gas. Since the KSPL sponge iron plant is planning to expand its capacity the added capacity is treated as a new facility and it takes into consideration of new facilities.

As stated above, the project activity under consideration meets all the applicability conditions of the baseline methodology. This justifies the appropriateness of the choice of the methodology in view of the project activity.

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

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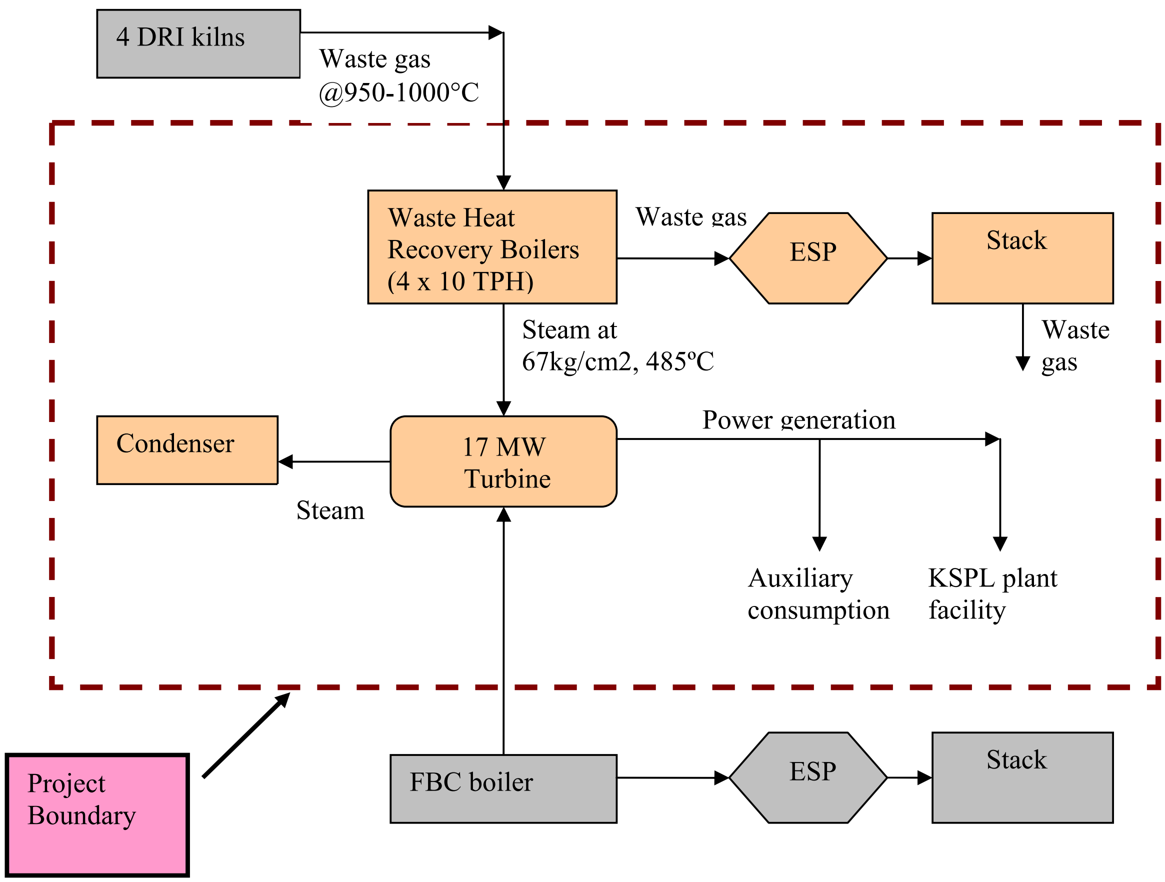
As per ACM0004 version 02, the spatial extent of the project boundary comprises the waste heat (or gas sources), captive power generating equipment, any equipment used to provide auxiliary heat to the waste heat recovery process and the power plants connected physically to the electricity grid that the proposed project activity would affect.

This CDM project covers the activities carried out for production of electricity at KSPL facility from their waste heat based CPP. These include recovery and utilisation of waste flue gases of DRI kiln after complete combustion, generation of steam, feeding this steam to the common header of the CPP, generating power in turbo-generator set and finally the evacuation of power from the power plant. The produced electricity by CPP is used for in-house consumption. There is no auxiliary fuel used in the waste heat recovery steam generation system.



The project boundary comprises of the WHR boiler unit, Economiser, Steam Turbine Generator, ESP and ash removal system. The project boundary starts from supply of waste flue gas at the boiler inlet to the point of evacuation of power to the KSPL facility.

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

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Identification of alternative baseline scenarios consistent with current laws and regulations

As highlighted in the baseline methodology the determination of the baseline scenario requires consideration of the following potential alternatives:

(a) The proposed project activity not undertaken as a CDM project activity
(b) Import of electricity from the grid
(c) On-site Captive power generation, using other energy sources other than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind etc
(d) A mix of options (b) and (c), in which case the mix of grid and captive power should be specified
(e) Other uses of waste heat and waste gases
(f) The continuation of the current situation, whether this is captive or grid-based power supply.

Analysis of the alternative scenarios:

The analysis of each of the above scenarios is done bearing in mind the factors considered by the promoters while making the investment decision, namely:

(i) Almost 50% of the total project cost is on account of the power plant;
(ii) The iron and steel industry is a highly cyclical industry and all industry indicators seem to suggest that the peak has been reached;
(iii) The generation of power by the system is completely dependent on the use of sponge iron unit, which in turn is dependent on the landed price of scrap metal which is also fluctuating and
(iv) The power plant cannot be technically operated if the PLF is below 50%.

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

The promoters have gone on record with their reluctance to set up the waste heat recovery based power unit, primarily on account of the high capital cost and the risks involved. In fact it was only when the CDM related revenue was highlighted to the investor group and concrete offers were produced to the investors that one of the investors Mr. Vijay Bothra agreed to invest the equity component required to fund the power plant. Otherwise, the investors were of the opinion that the project was very risky and preferred to set up the project by drawing the required power from the state electricity grid. It should be pointed out that the project had received sanction for the required power from the state electricity board.

In addition, all (most) similar projects being set-up in the country (in the SME segment) are being developed under the CDM. In view of the above, it may be concluded that at the point in time when the decision to proceed with the project was taken, the related CDM linked revenue were seriously considered and was a key factor responsible for the favorable decision (suitable documents will be provided to the DOE at the time of validation)

Thus the option to undertake this project as a non-CDM project was/is not a viable baseline scenario.

Option b: Import of electricity from the grid

In the absence of the project activity, import of electricity from the state grid, would perhaps have been the most economically feasible option. The key advantage with the state grid electricity is the fact that the upfront capital investment (and thus the related project risk) is very low and this was a key factor under consideration by the project developers.

Furthermore, the plant meets all the legal and regulatory requirements needed to be able to purchase electricity. In addition, the project had received an offer from the state government for supply of the entire power required by the project.

Option c: On-site Captive power generation, using other energy sources other than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind etc

In examining option (c) it is necessary to consider fuels, materials and technology available at the project site.

Natural gas as a possible fuel can be ruled out on account of lack of infrastructure for its supply to the project activity. In other words, supply constraints rules out natural gas as an option.

Wind & hydro: Renewable energy sources like wind and hydro are unreliable sources of power and were/are thus not serious contenders. In addition wind / hydro are very capital intensive and the state of Jharkhand does not have too many suitable wind / hydro sites.

Coal and diesel (including other liquid fossil fuel) are therefore left as alternatives for power generation. In terms of diesel, the setting up of a diesel power generation is not economically feasible. Even though the sponge iron plant will be installing diesel generators as back up units, on account of the high cost of operation, they will not be used continuously.

Of the potential options for captive units we are essentially limited to a small coal based electricity generation system as an alternative. Coal based boilers are installed in sponge iron plants to utilize the "char" (unburnt coal that exits the rotary kiln). The coal based generation plant, being cheaper in terms of up-front investment costs (estimates from manufacturers identified coal based boilers as 50% cheaper than waste heat recovery boilers), is generally a preferred option.

However the char must be mixed with coal in order to reduce the size of the boiler. The feasibility of generation from this set up depends on the access to coal over time and as coal is available in plenty in the eastern part of the country, this was an option that was under serious consideration by the project developers; as in addition to the cost advantage, it did not suffer from the risks of under utilization that the WHR based power plat was faced with.

The coal-based power plant was thus an option that could also be considered to be the baseline scenario.

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

In view of the issues mentioned above, option d is a possible baseline scenario. However in order to be conservative, the baseline emission has been computed considering a 100% power draw down from the eastern regional grid.

Option e: Other uses of waste heat and waste gases

In examining option (e), i.e. other uses of waste heat and waste gas, there have been no attempts to utilize the gases for other purposes in the region. The majority of plants have traditionally released the gas into the atmosphere and the installation of waste heat recovery boilers has only been considered recently. Out of the twenty two similar sponge iron units sanctioned /operating in the state of Jharkhand only one unit other than KSPL has a Waste Heat Recovery based power plant (and that too is being developed under the CDM). Therefore it is plausible to rule out this option in cases where the waste gases are generated in a sponge iron plant.

Option f :The continuation of the current situation, whether this is captive or grid-based power supply.

Grid based power is available to projects in the state and there are no limitations on obtaining a grid connection either by the type of industry or region. A plausible alternative baseline scenario is that of the electricity being generated by the operation of grid-connected power plants and by the addition of new generation sources.

Therefore, through the examination of the alternatives available to the project promoter it can be demonstrated that the possible options were limited to three:

- Import of electricity from the grid;
- Setting up a coal based power plant;
- The project activity that involves investment in sponge iron waste heat recovery;

Of the three options, the most plausible (and reliable) options would have been a combination of coal-based power together with additional power being drawn from the grid. However, in order to be conservative, the baseline has been considered to be 100% grid based power.

The project activity therefore gives rise to emission reductions through the displacement of grid based power generation sources in the supply of electricity to the sponge iron plant and to other third parties, both of which would have been satisfied by the grid under the baseline scenario.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality): >>

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As per the proposed baseline methodology, the project proponent is required to establish that the GHG reductions due to the project activity are additional to those that would have occurred in the absence of the present project activity as per the "Tool for demonstration and assessment of additionality version 02, 28th November 2005''.

Step 0: Preliminary screening based on the starting date of the project activity.

The project activity was started in March 2005 and is scheduled to be completed by August 2006 and hence there is no possibility that the project will be registered as CDM project activity before its commissioning.

However we give below the evidence as proof that incentive from CDM was seriously considered by KSPL, who is project participant.

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

The demonstration of the baseline scenarios (in section B4) incorporated the steps contained within this section and therefore to summarize the conclusions of the baseline scenario, it has been shown that the alternatives might be limited to the project activity not undertaken as a CDM and in its stead, the supply of electricity coming from the grid.

Step 2 – Investment analysis

Step 3 -- Barrier analysis

That the project activity is additional can be established by carrying out a barrier analysis as envisaged in Step 3.

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

There are 22 sponge iron plants in the state of Jharkhand, out of which only one plant including KSPL has developed waste heat recovery based power plant and the same also applies to availing carbon credits. Several barriers affected the penetration of this technology. The project activity faced barriers to successful implementation, which have been overcome by KSPL to bring about additional green house gas reductions.

The barriers are detailed below:

1. Investment barrier(s)

The key investment barriers are:
Availability of equity required for the project: The principal investment barrier is the availability of equity for the project. The investors had made it absolutely clear that the project was too risky and was not a preferred option. It was only based upon the consideration of the additional revenue from the sale of CERs being highlighted that one investor, Mr. Vijay Bothra, agreed to increase his contribution by INR 10 crore.

It may be mentioned that the detailed project report submitted to the banks specifically mentions that the project would be eligible to generate additional revenue from sale of CERs. The bank agreed to finance the project activity by analyzing the CDM possibility and the same has being quoted in the appraisal note. (Necessary documents will be shown to the DOE at the time of validation). It should be highlighted that the investor (Mr. Bothra) had initially agreed to invest the additional amount required for the power project in the form of Cumulative Convertible Preference Shares and it was only much later when project was being developed under the CDM that he agreed to bring in his additional investments in the form of equity.

In view of the above, it may be concluded that the additional revenue from the sale of CERs played a very important role in facilitating the mobilization of the required equity and debt for the project.

2. Technological and Operational barrier(s)

With a flow rate of the order of around 24,000 NM^3/hour of hot gas at a temperature of 950°C±50°C, the waste gas generated had a potential to generate net power of 10 MW. With the present heat energy available in the waste gases, the boiler capacity for the project was designed at 4X10 TPH each operating at 67kg/cm^2 pressure and 485±5°C temperature. As the major activity of the proponent is steel manufacturing, the management lacks the experience of operating the plant at higher configurations and this may turn out to be a difficult exercise for them.

Besides these risks and barriers regarding stand-alone operations, the project activity had to face operations risks related to the waste gas generation and its heat content, which affect the successful implementation of the project activity.

- If the heat content of the waste gas is not sufficient, the project activity will be directly affected and as a result, unable to generate power;

- Cumulative effect of sustained variable frequency operation due to fluctuations in waste gas supply (flow rate & temp) may have substantial bearing on safe and sustained operation of assets like the power plant equipments.

- Quality of products of a number of process industries like ingot manufacturing is heavily dependent on the quality of power supply. Poor quality of power supply not only results in reduced life of equipment but also in poor quality of products.

- Non-availability of waste gas at the required temperature can also result in a complete closure of the project activity. It has been further stated that resumption of production process takes a long time. Hence the power interruption even for a short spell destabilizes the manufacturing process, besides causing production loss and damage to the sophisticated equipments due to thermal shock.

- Moreover if the waste gas temperatures are greater than 1000^{o}C, the corrosive nature of the waste gases increase manifolds and it would have a detrimental effect on the boiler tubes designed for waste gases between 950-1000^{o}C. The project activity thus required the installation of expensive controls to ensure the waste gas temperatures does not exceed 1000^{o}C, however in case of any failure of such controls the DRI kilns will have to be shut down immediately; else the boiler would be damaged.

KSPL has also opted for steam dumping facility inbuilt in the turbo-generator, which is not a common practice in the industry.

The other major technical barrier is in the form of forward integration in the steel manufacturing process. Any fluctuations in the power output from the WHR will affect the production of steel to a larger extent as almost the entire production is based on power drawn from the WHR system with a contract maximum demand from the Jharkhand State Electricity Board limited to 1.5 MW.

The technical and operational barriers mentioned above make the investment in the proposed project activity a very risky proposition, not only from the project activity's point of view but also from the larger steel manufacturing operations point of view as any mishap could adversely affect the steel manufacturing operations, leading to significant financial losses..

3. Other barrier(s) - Managerial resources barrier

KSPL is in the business of manufacturing sponge iron and its personnel lack the proper knowledge of and exposure to the complications involved in power generation, power plant operations, load synchronization and its maintenance.

Therefore KSPL management would need to arrange for professional training programmes in order to improve the skill of their personnel in power plant activities. KSPL personnel had to put in consistent effort towards developing their in-house capabilities in order to successfully implement the project activity. It must be pointed out that specialized manpower required to operate the plant is not available locally and has to be recruited from other parts of the country.

In spite of all these barriers and large financial risks, KSPL has decided to implement the waste heat recovery based power plant, in order to reduce GHG emissions thereby generating power from an environment friendly source.

Sub-step 3 b. Show that the identified barriers would not prevent a wide spread implementation of at least one of the alternatives (except the proposed project activity already considered in step 3a):

It has been observed in Sub-step 3a that the project activity had its associated barriers in successful implementation, which have been partially overcome in order to implement the project activity and reduce additional grid-based greenhouse gas reductions. In a broader sense, these barriers can be categorized as below:

· Investment barrier
· Institutional/ Regulatory barrier and
· Technical barrier

As described in Section B.4 above, “Alternative b: Import of electricity from the grid” was found to be one of the baseline scenario; the other alternative being a small-scale coal based power plant. This alternative option was evaluated with respect to the above-mentioned barriers. So far as investment barrier is concerned, there is no high initial cost or high operational and maintenance cost required for Alternative 1.

Hence Alternative 1 can be considered as plausible alternative in the absence of the proposed project activity.

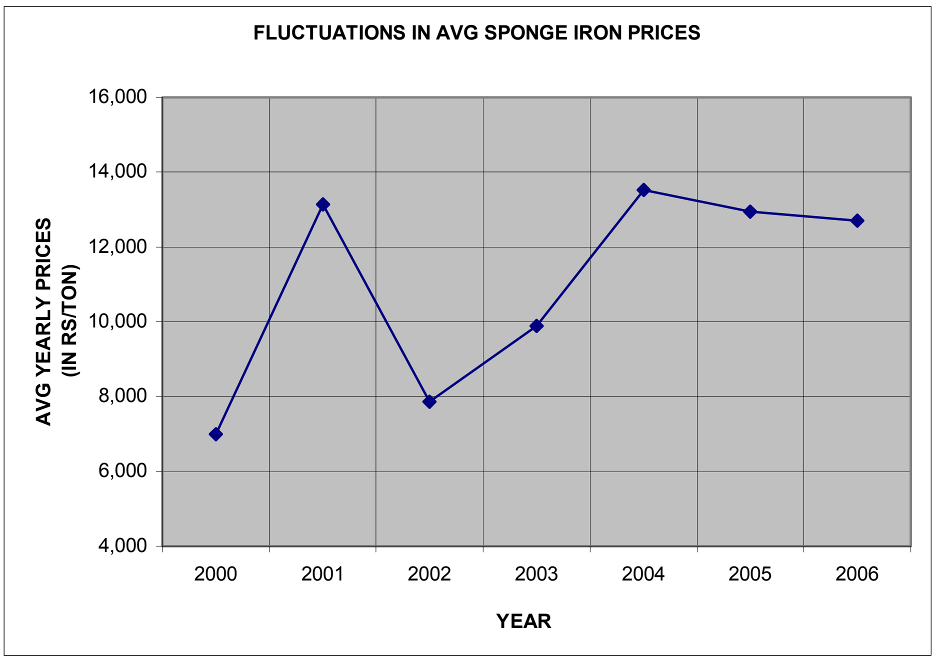
The institutional barriers are mainly related to obtaining the necessary approvals for setting up a power plant either for captive use or for supply to the grid along with captive consumption. However, Alternative 1 would not have faced these barriers.

The operational barriers mentioned above are related to project activity operation and stand alone operations. However Alternative 1 would not have faced all these operational barriers.

The above discussion clearly reveals that Alternative b would not have faced any of the barriers associated with implementation of the project activity. Moreover there were no such impediments for sponge iron-manufacturing plants (and KSPL) to implement Alternative b. Therefore “Alternative b: Import of electricity from the grid” is an alternative option, which could be adopted by KSPL without facing the barriers prevailing in the project activity implementation.

Market barrier: The market scenario of the sponge iron in the country is volatile; the prices for the final product too have been fluctuating[1] as shown in the graph given below. The fluctuation in the price of the final product is significant as the project was conceptualized at a point in time when the steel prices had peaked and were showing a downward trend. The promoters, being aware of this, were very keen to limit their total project exposure.

The proposed project activity (waste heat based power plant) is totally dependent on the upstream sponge iron plant and also to a large extent on the prices of scrap (as below a level, it would make economic sense to shift partially / completely from sponge iron to scrap). Furthermore, the market conditions being volatile, there is the possibility of the project promoters having to discontinue the project activity and shift to alternative power sources. This may lead to either down-scaling or shutting down the upstream sponge iron plant altogether and thus terminating the project activity (the project activity will cease to generate power at below ~ 35% PLF). Therefore there is a significant capital risk associated with the project



Step 4 – Common practice analysis

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

There are a total of 22 sponge iron plants in operation or under implementation in the state surrounding the proposed project activity. Of the 22 sponge iron plants, only two have waste heat recovery systems. KSPL's sponge iron plant is one among them. It should be pointed out that the other project too is seeking registration under the CDM.

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[1] http://www.indiainfoline.com/sect/stee/db71.html

It may be concluded that the there are significant barriers (technical / investment / market related etc.) that has resulted in the low penetration level of the technology in the area and the proposed project activity is NOT a common practice.

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

From the above analysis the proposed project activity is not common practice amongst plants facing similar techno-economic circumstances.

Step 5 – Impact of CDM registration

The main benefits of CDM registration relate to the financial and investment impacts of the CDM revenue stream as highlighted in step 2. Furthermore, the inherent risks in undertaking the project are reduced through the increased return associated with registering the project under CDM, thereby specifically offering the plant greater leeway in its first two years of operation when the promoter is gaining experience of operating the plant efficiently and assisting the project in achieving financial closure. In addition, the registration of the project under the CDM would enhance KSPL's profile as a company that is concerned about the environment that it operates under.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the methodology ACM 0004, **Project emissions** are applicable only if auxiliary fuels are fired for generation startup, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery Boiler**.** However, auxiliary fuel firing would not be required for start up and there is no provision for auxiliary fuel firing for additional heat gain of waste gases in the project activity.

The project proponent has identified all the possible sources, which could have directly or indirectly added to GHG emissions in the project activity:

- GHG emission due to heat energy extraction in the WHRB is zero, as there is no change in chemical composition of waste gases at the inlet and outlet of the boiler.
- No major on-site emissions for meeting the auxiliary consumption, since the plant runs on the power that is generated by the project activity.

Baseline Emissions are given as:

$BE_{electicity,y} = EG_y * EF_{electricity,y}$

Where,

EG_y = Net quantity of electricity supplied to the manufacturing facility by the project during the year y in MWh, and

$EF_{electricity,y}$ = CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y (tCO_2/MWh)

As per the methodology, if the project displaces the electricity generation by fossil fuel combustion for captive purpose then the baseline scenario is as follows:

<u>Selected Option 2.</u> Since baseline scenario is grid power imports (As illustrated in B.4)

Emission Factor of the Grid (EFy)

Baseline emission factor of eastern region (EF*y*) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors according to the following three steps.

STEP 1. Calculate the Operating Margin emission factor

As per ACM0002, the simple OM method can only be used where low-cost must run resources constitutes less then 50% of total grid generation of average of the five most recent years. As illustrated in Annex 3, Since the average of low cost must run resources in the five most recent years constitutes less then 50% of the total grid, the simple OM method is selected.

The simple OM emission factor ($EF_{OM, simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MU) of all generating sources serving the system, not including low-operating cost and must-run power plants.

$$EF_{OM,y} = \frac{\Sigma\, F_{i,j,y} * COEF_{i,j\,y}}{\Sigma\, GEN_{j,y}}$$

where *Fi ,j, y* is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*,
j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports to the grid,
COEFi,j y is the CO2 emission coefficient of fuel *i* (tCO2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y*, and
GENj,y is the electricity (MWh) delivered to the grid by source

The fuel consumption in individual plants as required by the above formula is not readily and correctly available. However, Central Electricity Authority publishes the Station Heat Rate (SHR), which is a measure of plant efficiency in Kcal/KWh. In order to calculate the emission factor by the simple OM method, the formula in the numerator is expressed as:

$$\Sigma\, F_{i,j,y} * COEF_{i,j\,y} = \Sigma\, \frac{GEN_{j,y}.\ SHR_i}{NCV_i} \times NCV_i \times EF_{CO2i} \times Oxid_i$$

Or $\Sigma\, GEN_{j,y}.\ (SHR_i \times EF_{CO2i} \times 44/12 \times Oxid_i)$

Where,
SHRi is the station heat rate with fuel i
EF_{CO2i} is the emission factor per unit of energy of fuel j and
Oxidi is the oxidation factor for fuel i

The values of SHRi are available from CEA report on Performance Review of Thermal Power Stations 2004-05 Section 13 and Ministry of Power websites. Values of EF_{CO2i}, Oxidi are available from Revised 1996 IPCC guidelines for Greenhouse Gas Inventories Workbook and Reference Manual for various fuels used in Indian power plants.

STEP 2. Calculate the Build Margin emission factor
The project developer has adopted option 1 (Ex-ante), which requires to calculate the Build Margin emission factor *EFBM,y ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission

STEP 3. Baseline Emission Factor
This is in conformance with the guidelines in the section "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM 0002).

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

(Copy this table for each data and parameter)

Data / Parameter:	EF_y
Data unit:	tCO2e/GWh
Description:	CO2 Emission Factor of the grid
Source of data used:	CEA reports
Value applied:	927.19
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is used for estimating the emission reductions from the project activity. This is calculated by using the available data from CEA reports.
Any comment:	Calculated as the weighted sum of OM and BM Emission Factor

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO2e/GWh
Description:	CO2 OM Emission Factor of the grid
Source of data used:	CEA reports
Value applied:	976.91
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is used for arriving the combined margin emission factor for the grid. This is calculated by using the available data from CEA reports.
Any comment:	Calculated as option 1 (simple OM) as per the referred methodology ACM 0002

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO2e/GWh
Description:	CO2 BM Emission Factor of the grid
Source of data used:	CEA reports
Value applied:	877.47
Justification of the choice of data or description of measurement methods	Data is used for arriving the combined margin emission factor for the grid. This is calculated by using the available data from CEA reports.

and procedures actually applied :	
Any comment:	Calculated as option 1 (Ex-ante) as per the referred methodology ACM 0002

B.6.3 Ex-ante calculation of emission reductions:

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As per the methodology, the project emissions are applicable only if auxiliary fuels are fired for generation start up, in emergencies, or to provide additional heat gain before entering the WHRB. However auxiliary fuel firing would not be required for start up and there is no provision for auxiliary fuel firing for additional heat gain of the waste gases in the project activity.

The project proponent has identified all the possible sources, which could have directly or indirectly added to GHG emissions in the project activity:

- GHG emission due to heat energy extraction in the WHRB is zero, as there is no change in chemical composition of waste gases at the inlet and outlet of the boiler.
- No major on-site emissions for meeting the auxiliary consumption, since all the auxiliary of the power plant runs by the power that is generated by the project activity.

Project emissions are therefore zero.

No leakage is considered as per the methodology.

The total project activity emissions are zero

Baseline Emissions are given as:

$BE_{electicity,y} = EG_y * EF_{electricity,y}$

Where,

EG_y = Net quantity of electricity supplied to the manufacturing facility by the project during the year y in MWh, and

$EF_{electricity,y}$ = CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y (tCO_2/MWh)

As per the methodology, if the project displaces the electricity generation by the fossil fuel for the captive purpose then the baseline scenario is **Option b. if baseline scenario is grid power imports**

Emission Factor of the Grid (EFy)

Baseline emission factor of eastern region (EF*y*) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors according to the following three steps.

STEP 1. Calculate the Operating Margin emission factor
STEP 2. Calculate the Build Margin emission factor
STEP 3. Baseline Emission Factor

The baseline emission factor (EF*y*) of the chosen grid is calculated as combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors following the guidelines in the section "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM 0002).

Net quantity of electricity supplied to the manufacturing facility by the project (EG_y)

Net units of electricity substituted in the grid (EGy) = (Total electricity generated-Auxiliary Consumption)
Net units of electricity substituted in the grid (EGy) = (EG_{total} - EG_a)

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

$ER_y = BE_y - PE_y$

Where:
ER_y are the emissions reductions of the project activity during the year y in tons of CO_2,
BE_y are the baseline emissions due to the displacement of electricity during the year y in tons of CO_2
PE_y are the project emissions during the year y in tons of CO_2

Therefore,

$ER_y = BE_y - PE_y$

ER_y = 56,176 – 0 = 56,176 tCO2e/yr

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

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Emission Reductions arising from the project activity

Year	Baseline emissions (tCO2e)	Project emissions (tCO2e)	Emission Reductions (tCO2e)
August 2006	23,406	0	23,406
2007	56,176	0	56,176
2008	56,176	0	56,176
2009	56,176	0	56,176
2010	56,176	0	56,176
2011	56,176	0	56,176
2012	56,176	0	56,176
Jan 2013 – July 2013	32,770	0	32,770

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	EG_y
Data unit:	MWh/yr
Description:	Net electricity generation available for captive purpose
Source of data to be used:	Project Records/Log Book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data holds a significant purpose for determining the baseline emissions and the emissions reductions accruing due to the project activity. This is calculated as the difference between the total waste heat power generated for a year from the auxiliary power consumption during that year.
Description of measurement methods and procedures to be applied:	100% of the data is measured and will be recorded continuously. Data recorded will be stored in the electronic/paper from for crediting period+2years.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculating power contributed from waste heat recovery steam generation system of the CPP.
Any comment:	Meters at plant will automatically measure the data. The data will be recorded in project logbook.

Data / Parameter:	EG_a
Data unit:	MWh/yr
Description:	Auxiliary consumption of the power plant
Source of data to be used:	Project Records/Log Book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data holds a significant purpose for determining the baseline emissions and the emissions reductions accruing due to the project activity.
Description of measurement methods and procedures to be applied:	100% of the data is measured and will be recorded continuously. Data recorded will be stored in the electronic/paper from for crediting period+2years.
QA/QC procedures to be applied:	This data would be measured online and recorded in papers continuously
Any comment:	Meters at plant will automatically measure the data. The data will be recorded in project logbook.

Data / Parameter:	EG_{total}
Data unit:	MWh/yr
Description:	Total electricity generated from the project activity
Source of data to be used:	Project Records/Log Book
Value of data applied for the purpose of calculating expected	The data holds a significant purpose for determining the baseline emissions and the emissions reductions accruing due to the project activity.

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	100% of the data is measured and will be recorded continuously. Data recorded will be stored in the electronic/paper from for crediting period+2years.
QA/QC procedures to be applied:	This data would be measured online and recorded in papers continuously
Any comment:	Meters at plant will automatically measure the data. The data will be recorded in project logbook.

Data / Parameter:	S_{gen}
Data unit:	Tonnes/ day
Description:	Total Steam Generated from both WHR and AFBC boiler
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the effective Waste heat recovery steam flow per day.
Description of measurement methods and procedures to be applied:	This will be measured from the data recorded in the logbooks on a daily basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. It is a critical parameter that would used to calculate the net / effective WHR steam.
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters

Data / Parameter:	S_{cons}
Data unit:	Tonnes/day
Description:	Total steam consumed by TG
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the effective Waste heat recovery steam flow per day.
Description of measurement methods and procedures to be applied:	This will be measured from the data recorded in the logbooks on a daily basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are

	calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. It is a critical parameter that would used to calculate the net / effective WHR steam.
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters.

Data / Parameter:	S_{vent}
Data unit:	Tonnes
Description:	Total steam vented/dumped in the CPP
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the effective Waste heat recovery steam flow per day.
Description of measurement methods and procedures to be applied:	This will be measured from the data recorded in the log books on a daily basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. It is a critical parameter that would used to calculate the net / effective WHR steam.
Any comment:	The data will be calculated on a daily basis.

Data / Parameter:	S_{WHR}
Data unit:	Tonnes/day
Description:	Flow of WHR steam from common header
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the effective Waste heat recovery steam flow per day.
Description of measurement methods and procedures to be applied:	This will be measured from the data recorded in the log books on a daily basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. It is a critical parameter that would used to calculate the net / effective WHR steam.

Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters

Data / Parameter:	S1
Data unit:	Tonnes/day
Description:	Effective WHR Steam
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the effective Waste heat recovery steam flow per day.
Description of measurement methods and procedures to be applied:	This will be calculated (S_{WHR}- S_{vent}) and would be recorded on a daily basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. It is a critical parameter that would used to calculate the net / effective WHR steam.
Any comment:	The data will be calculated on a daily basis.

Data / Parameter:	T1
Data unit:	^{0}C
Description:	Avg. Temp of WHR steam before common header
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the Total Enthalpy from Effective WHR steam.
Description of measurement methods and procedures to be applied:	This will be measured from the data which is recorded continuously in the log books. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculation of WHR steam parameters.
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters .

Data / Parameter:	P1
Data unit:	^{0}C

Description:	Avg. pressure of WHR steam before common header
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the Total Enthalpy from Effective WHR steam.
Description of measurement methods and procedures to be applied:	This will be measured from the data which is recorded continuously in the log books. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculation of WHR steam parameters
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters.

Data / Parameter:	h1
Data unit:	Kcal/kg
Description:	Enthalphy
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the Total Enthalpy from Effective WHR steam.
Description of measurement methods and procedures to be applied:	This will be calculated from steam tables/mollier diagram The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculation of WHR steam parameters
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters.

Data / Parameter:	H1
Data unit:	Kcal
Description:	Enthalphy of WHR steam
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of	The data will be used for calculating the Total Enthalpy from Effective WHR steam.

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	This will be calculated as S1 x h1. The data will be recorded on daily basis and archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculation of WHR steam parameters
Any comment:	The data would be calculated on daily basis.

Data / Parameter:	S 2
Data unit:	Tonnes/day
Description:	Flow of Steam from common header
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the Total Enthalpy from Effective WHR steam.
Description of measurement methods and procedures to be applied:	This will be calculated and would be recorded on a daily basis. The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculation of FBC steam parameters
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters

Data / Parameter:	T2
Data unit:	^{0}C
Description:	Avg. Temp of AFBC steam before common header
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the Total Enthalpy from Effective AFBC steam.
Description of measurement methods	This will be measured from the data which is recorded continuously in the log books. The data would be archived either electronically or in papers and will be

and procedures to be applied:	available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculation of FBC steam parameters.
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters

Data / Parameter:	P2
Data unit:	Kg/cm^2
Description:	Avg. Pressure of AFBC steam before common header
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the Total Enthalpy from Effective AFBC steam.
Description of measurement methods and procedures to be applied:	This will be measured from the data which is recorded continuously in the log books. The data would be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculation of FBC steam parameters
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters

Data / Parameter:	h2
Data unit:	Kcal/kg
Description:	Enthalphy
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the Total Enthalpy from Effective WHR steam.
Description of measurement methods and procedures to be applied:	This will be calculated from steam tables/mollier diagram The data will be archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to	QA/QC procedures have been planned. The level of uncertainty level of data is

be applied:	low. This data would be used for calculation of FBC steam parameters
Any comment:	The data will be monitored from flow meters at plant and DCS. Manager in-charge would be responsible for calibration of the meters.

Data / Parameter:	H2
Data unit:	Kcal
Description:	Enthalpy of AFBC steam
Source of data to be used:	Project records and log books maintained by the plant authorities.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The data will be used for calculating the Total Enthalpy from Effective AFBC steam.
Description of measurement methods and procedures to be applied:	This will be calculated as S1 x h1. The data will be recorded on daily basis and archived either electronically or in papers and will be available upto two years after the crediting period. The monitoring and controls is part of the Distributed Control System (DCS) of the entire plant. All instruments are calibrated and marked at regular interval to ensure accuracy.
QA/QC procedures to be applied:	QA/QC procedures have been planned. The level of uncertainty level of data is low. This data would be used for calculation of FBC steam parameters
Any comment:	The data would be calculated on daily basis.

B.7.2 Description of the monitoring plan:

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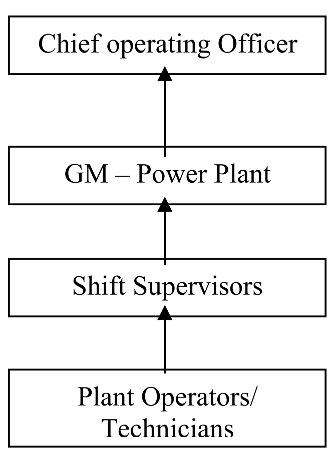
The management of the plant will designate one person to be responsible for the collation of data required to conduct the monitoring plan who will report to the General Manager (GM). The management of the plant will put in place monthly reporting of electricity generation. This data will be part of the management information systems for the power plant. The emission reductions will be calculated monthly, reported back to the management of plant and incorporated into existing management information systems. The organization chart is presented below:



The monitoring of the project activity will be according to the "Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation." -ACM0004 /version 02, Sectoral scope: 01, 03 March 2006.

(A) Purpose
To define the procedures and responsibilities for GHG Performance, Project Management , Registration, Monitoring, Measurement and Reporting of data and dealing with uncertainties.

(B) Scope
This procedure is applicable to 10 MW waste heat based power project i.e. of KSPL, Jharkhand.

(C) Authorities and Responsibilities of Project Management, Registration, Monitoring, Measurement and Reporting:

Shift Supervisor: Responsible for reporting hourly data of the steam generated from boilers, steam fed to turbines, parameters of steam and flow meter reading of the Captive Power Plant. The report is then sent to the General Manager (Power Plant) for his review.

General Manager (Power Plant): Responsible for reviewing the monitored parameters on an hourly based and presenting a monthly executive summary report, duly signed by himself, to the Chief Executive Officer.

(D) **Training of Monitoring Personnel:**
A training schedule has been prepared for providing time to time training to the monitoring personnel by the senior competent authorities of the management as well as the equipments supplier and also by the Internal CDM Audit Team and CDM consultants.

(E) **Procedure for emergency preparedness**:
In accordance to the Industrial Health and Safety Department Government of Jharkhand a Site Emergency Plan and Disaster Management Plan has been prepared and kept ready with the Personnel Department of the Project and requisite arrangements to deal with fire, electrical accident, mechanical accidents etc. are made in the project. Personal safety appliances are provided to the workers according to the requirement. Safety training and safety drill is provided from time to time by the personnel department.

(F) **Procedure for calibration and maintenance of monitoring equipment:**
All the monitoring equipments shall be calibrated as per the recommendation of the manufacturer at scheduled intervals from accredited laboratory Shift Supervisor will be responsible for getting the instruments checked and calibrated as per calibration schedule

(G) **Handling of Day-to-Day record**: **General Manager / Chief Executive Officer:** Responsible for summarizing data of Electrical, Mechanical Departments and authorize on a daily and monthly basis.

(H) **Procedure for internal Audit.**

An Internal CDM audit manual has been prepared and implemented. A team consisting of experienced personnel will be constituted for the Internal CDM Audit, who will conduct yearly Audit. Wherever required the assistance from the CDM PDD consultants will be sought.

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

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Date of completing the final draft of this baseline section: 03/01/2006

Name of person/ entity determining the baseline: Kohinoor Steel Pvt. Ltd. And its consultants

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:

>>

01/03/2005

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

>>

30y-0m

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:

>>

01/08/2006

C.2.1.2. Length of the first crediting period:

>>

7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

SECTION D. Environmental impacts

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

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The Project activity is to produce 10 MW power based on waste heat recovery based steam generation (WHRB) and steam turbines. There are no additional GHG emissions other than the existing GHG emissions in the absence of project activity.

The installation of WHRB and CPP requires approvals of IBR (Indian Boiler Regulation) and Jharkhand Environment Conservation Board (CECB) and both the approvals will be received before the Commissioning of project activity.

Environmental impact is negligible as the project activity benefits the local, regional and global environment by,

- Reducing the thermal pollution which could have been caused by emitting waste gases at about 950^0C into atmosphere.
- Generates electricity without adding any additional GHG emissions. The power generated by new project activity will be used for in house activity will beused for in house requirement and consumption without any T&D losses as the location of power generation is in the same premises.
- Waste water generation is minimised as technology employed is closed circuit usage of air cooled condenser in STG. The generated waste water shall be used for plantation to create green belt.
- Noise level from equipments shall be kept within legal limits.
- The project will not generate on its own any fly ash due to power generation from the project activity. So there will be no fly ash problem to the extent of power generated by the project activity without the combustion of Coal.
- The proposed ESP shall remove the ash contained in hot flue gases which will be collected in ash Hopper. This ash will be given free of cost to cement plants and brick manufacturers for further economical benefits and use. The ash used for production of bricks saves the valuable productive soil, also it reduces the air pollution caused by the conventional brick kilns, due to the coal burning. The ash consumed in Cement making reduces the limestone and coal consumption, thus natural resources are saved.
- The project activity will also save the natural coal resource to the extent of power generated by it.

However 10 MW power from WHRB’s constitute more than 50% of the 17MW CPP. The balance 7MW will be generated by FBC boiler which uses Coal, Char/ Dolochar as fuel.

The KSPL implemented the CDM project activity as one of their commitment to ensure maximum global and local benefits in relation to some environmental and social issues. With regard to the local environment the project has positive effects on local air and water quality.

The project does not have any adverse impact on environment. The project requires an “approval for installation” from the Pollution Control Board and in each subsequent year, a “consent to operate” will also be required from the Pollution Control Board. These approvals will be part of the monitoring programme and will be produced at the time of validation and verification.

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:

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As per the host party regulations, the Environment and Impact Assessment is not required for the project activity. The project activity is not polluting and the impacts associated with the project activity are insignificant. However the project proponent does monitor the environment impacts and abate the insignificant impacts by the following programmes:

Green belt development:

It is proposed to have at least 10 meters wide green belt all around the plant site by planting suitable species of evergreen broad leaves type. Plantation is also envisaged on both sides of the plant road. Adequate tree plantations will substantially abate the dust pollution, filter the polluted air, reduce the noise and ameliorate the plant environment. Where tree plantations will not be feasible, the unpaved land shall be covered with grass and small height bushes in order to avoid soil erosion.

Pollution monitoring

Necessary provisions would be made for routine monitoring of stack emissions, quality noise level, and water gravity as required by the regulations and for monitoring environment management as implemented.

Environmental Monitoring:

The emission levels from the stack and the ambient air quality around the power plant will be periodically monitored. Further, the effluent quality and noise levels will also be regularly monitored. The instruments and the equipment necessary for monitoring will be made available in the plant laboratory.

Plant Safety and Industrial Hygiene Measures:

These two aspects need to be given due attention at the time of detailed engineering meeting all the prevalent regulations of Factory Act and recommendations made by the regulating authority. Fire protection systems by means of providing fire hydrants, fire extinguisher at vulnerable points within the plant boundary have been envisaged. No fire tender provisions have been considered, as this would be made available from local authorities. A first aid unit has to be considered for the operating and maintenance personnel. All the necessary safety kits like hand gloves, gumboots, aprons, helmets etc. need to be provided. Proper sanitation facilities, rest room, adequate plant lighting is also envisaged for the proposed project.

Conclusion:
Project activity is environment friendly and creates employment and other benefits and promotes sustainable developments.

SECTION E. Stakeholders' comments

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

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KSPL identifies the following as stake holders to keep the transparency in the operational activity of the project promoter and thereby meeting local/ environmental regulations.

The stakeholders identified are:

1. Jharkhand Pollution Control Board
2. Jharkhand State Electricity Board
3. Irrigation Department
4. Local Village Panchayat

Name of the Stakeholder	Summary
Jharkhand Pollution Control Board (JPCB)	JPCB, a regulatory body to monitor environmental impacts and environmental management of industries. Accords clearances for setting up of industries in the state after ensuring adherence to the statutory regulations. Also gives consent to start the operation of the project if satisfied with the environmental management and pollution control measures.
Jharkhand State Electricity Board (JSEB)	Executes the Power Purchase Agreement (PPA). The company has approached the JSEB and availed 1.5 MW power to operate the Integrated steel plant. As the proposed project activity does not export any power to grid, execution of PPA is not necessary and also the company has got the permission to operate the CPP.
Irrigation Department	Accords clearance for utilizing water resources in Jharkhand state. The MoU signed between the PP and the Govt, the department is complying to give the entire infrastructure necessary for the project.
Local Village Panchayat	Accords permission for setting up of the project under the jurisdiction of the village. The village Panchayat /local elected body of representatives administering the local area is a true representative of the local population in a democracy like India. Hence the public comments received from the village Panchayat / elected body of representatives administering the local area give a proper reflection of the opinions of the local people.

E.2. Summary of the comments received:

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Name of the Stakeholder	Steps taken on due account of comments
Jharkhand Pollution Control Board (JPCB)	Permission have been sought from the State agency like JPCB wherever required legally and have been received and other State agencies have been apprised of the project activity. The project has received the necessary clearances from JPCB. No comments received from JPCB.
Jharkhand State Electricity Board (JSEB)	Permission have been sought from the State agency like JSEB wherever required legally and have been received and other State agencies have been apprised of the project activity. No comments received from JSEB.
Irrigation Department	Permission have been sought from the Irrigation Department wherever required legally and have been received. No comments received from JSEB.

Local Village Panchayat	KSPL inserted the advertisement in local news paper seeking stake holder comments and received few positive responses which were appreciative of the project activity. The meeting was held in the factory premises. Findings shows that no major concerns raised by the local people, since the project activity is implemented in the KSPL factory premise, it didn't cause any displacement of local population. Furthermore it has created a significant job opportunities for the local people. KSPL authority is also planning to arrange for some proper professional training programmes for the operators of the power plant, which has helped them improving their quality of work. KSPL management apprised the representatives of village Panchayat of village about the project activity. The members of Panchayat appreciated and had expressed their no objection for project activity.

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

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As no comments were received no action has been taken in this regard

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Kohinoor Steel Pvt. Ltd
Street/P.O.Box:	11 Middleton Row, Suit #7, Ist Floor
Building:	New Asiatic Mansion
City:	Kolkata
State/Region:	West Bengal
Postfix/ZIP:	700 071
Country:	India
Telephone:	091 033 22274685/ 3959 6737
FAX:	091 033-22274686
E-Mail:	admin@kohinoorsteel.net
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Bothra
Middle Name:	
First Name:	Vijay
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project activity.

Annex 3

BASELINE INFORMATION

The project activity would generate electricity by utilizing the heat content of the waste gas of the sponge iron kiln and displace an equivalent amount of electricity from the grid. The emission reduction resulting from the project activity would depend on the emission factor of the grid mix. Therefore it is required to select the appropriate grid where an equivalent amount of electricity would be displaced by the electricity generated from the project activity.

Choice of the Grid

Indian power grid system (or the National Grid) is divided into five regional grids namely Northern, North Eastern, Eastern, and Southern and Western Region Grids. The Eastern Regional Grid consists of Bihar, Jharkhand, Orissa, West Bengal and Sikkim sector grids. These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations. While the power generated by own generating stations is fully owned and consumed through the respective state's grid systems, the power generated by central generating stations is shared by more than one state depending on their allocated share. Eastern Region Electricity grid facilitates the share of power generated by the central generating stations.

Eastern regional grid has a total generating capacity of 17909.27 MW[2] as on 31.12.2004, of which private and Central stations has a generating capacity of 9994.51 MW and the balance is being generated by power stations at state level. Thus more than 50% of the generation capacity is coming from the central and private generating stations. As all the states forming part of the Eastern grid are dependent on power allocation from Central generating stations, Eastern region regional grid is considered as the appropriate grid system for the project activity.

As per the methodology, if the project displaces the electricity generation by fossil fuel for the captive purpose then the baseline scenario is **Option b. If baseline scenario is grid power import**

Emission Factor of the Grid (EFy)

The baseline emission factor (EF*y*) of the chosen grid is calculated as combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors following the guidelines in the section "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM 0002).

Step 1: Calculation of Operating Margin Emission Factor for the region based on Simple OM

Factor	2005	2004	2003
∑ Fi,,j,y x COEF i,,j (tons/year)	74872165	66979138	58590278
∑ GEN i,,j (MU)	76649.06	68558	59972

[2] Ministry of Power-Annual Report 2004-2005

∑ EF OM,y (tCO2/yr)	976.8	976.9	976.94
Average ∑ EF OM,y (tCO2/yr)	976.9		

Step 2: Calculation of Build Margin Emission Factor for the region (ex-ante):

Power Stations	Installed capacity MW	Fuel	Generation GWh 2005	Emissions tCO2 2005	Year of Commission
Talcher STPS	500	Coal-3E	3317	3618963	2003
Talcher STPS	500	Coal-3E	3317	3618963	2003
Chandil	2 x 4	Hydro	0	0	2002
Bakreswar	210	Coal 1D	1590	1734745	2001
Upper Indravati	150	Hydro	2851.3	0	2001
Upper Indravati	150	Hydro		0	2000
Upper Indravati	150	Hydro		0	1999
Upper Indravati	150	Hydro		0	1999
Bakreswar	210	Coal 1D	991	1081216	2000
Teesta	7.5 x 3	Hydro	107.87	0	1999
Teesta	7.5 x 3	Hydro		0	1998
Teesta	7.5 x 3	Hydro		0	1997
Bakreswar	210	Coal 1D	1597	1742383	1999
Mejia	210	Coal 3E	1583	1727108	1999
Rangit	3 x 20	Hydro	369.64	0	1999
Tenguhat	210	Coal 1D	0	0	1998
Mejia	210	Coal 3E	1282	1398707	1998
E.G. canal	5	Hydro		0	1997
Budge Budge	500	Coal 1D	3784.46	4128978	1997

∑ Fi,,j,y x COEF i,,j (tons/year)	14922084
∑ GEN i,,j (MU)	17005.81
∑ EF BM,y (tCO2/yr)	877.47

Step 3 Baseline Emission Factor (EF_y)

∑ EF BM,y	877.47 tCO2e/ GWh
∑ EF OM,y	976.91 tCO2e/ GWh
∑ EFy (Avg of OM &BM)	**927.19 tCO2e/Gwh**

Annex 4

MONITORING INFORMATION

The CDM stands on the quantification of emission reductions and keeping the track of the emissions reduced. The project activity reduces the carbon dioxide whereas an appropriate monitoring system ensures this reduction is quantified and helps maintaining the required level.

The methodology requires monitoring the following

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

KSPL have the monitoring plan with the aim that complete integrity and transparency shall be maintained in the following manner.

- Data monitoring and maintaining records of readings /printouts of readings from installed instrumentation;
- Calculation of emissions reductions

Dedicated personnel with defined responsibilities will be made available. A third party monitoring of the data and calculations will also be carried out for maintaining accuracy.

The following data will be submitted to concerned authorities
1. Monthly report on power generation
2. Monthly report on auxiliary consumptions
3. Monthly report on steam generation and consumption

Section B gives reporting tables to be followed:

The following are the parameters to evaluate the net electricity generation from the WHRB of the captive power plant, along with the sources of emissions mentioned in section B needed to be monitored:

- Total steam generated from both WHR and AFBC boiler
- Total steam consumed by TG
- Total steam vented in the CPP
- Flow of WHR steam from common header
- Effective WHR steam
- Average temperature and pressure of WHR steam and AFBC steam before common header
- Average pressure of WHR steam before common header
- Enthalpy of WHR steam and AFBC steam

The monitoring system for the GHG abatement project activity is described below:

Monitoring System

The monitoring system for the CDM project activity has been developed in order to determine the baseline emissions and the project emissions (if any) over the entire credit period. The net units of electricity generated needs to be monitored by power meters at the plant. The actual amount of CO_2 reduction however depends on the generation mix and production scenario of the grid that is taken into consideration in the grid emission factor calculation.

For monitoring the net unit of electricity generated, KSPL has devised an instrumentation system as described below:

Instrumentation and Control System

The instrumentation and control system is the key aspect for good functioning of any monitoring and verification system of a CDM project activity. The project activity has employed the state of art monitoring and control equipment that will measure, record, report, monitor and control various key parameters like total power generated, power used for auxiliary consumption, flow rate, temperature and pressure parameters of the waste gas, steam generated and steam sent to turbine to generate power. The instrumentation and control system for the power plant is designed with microprocessor-based instruments having adequate provisions to control and monitor the various operating parameters for safe and efficient operation of the waste heat recovery boiler and the turbo generator unit.

The monitoring system mainly comprises of metering of:

Gross Electrical Energy Generation:
The gross electrical energy generated by the waste heat recovery based power plant is monitored continuously in a PLC system installed in the power plant. The system facilitates automatic logging of gross electricity generation data on an hourly basis. The same can be verified with the monitored data on gross electricity generation, as recorded manually in the 'Electrical Log Sheet' maintained by the Electrical Department of KSPL.

In-house Electrical Energy Consumption:
The electrical energy consumption for KSPL plant is monitored and reported in the 'Log Book' maintained by the Electrical Department of KSPL.

Auxiliary Electrical Energy Consumption:
The auxiliary electrical energy consumption for power plant is monitored and reported in the 'Log Book' maintained by the Electrical Department of KSPL.

Frequency of monitoring
All the parameters related to the GHG abatement project activity are monitored as per the guidance provided in the "Approved consolidated monitoring methodology ACM0004". The frequency of monitoring for each of the parameters is detailed in Section B. KSPL would ensure the adherence to the instructions as suggested by the methodology.

Reliability of monitored parameters
Quantification of GHG emission reductions resulting from the project activity depends on the accuracy of all the monitored parameters. The amount of emission reduction units is proportional to the net energy generation from the project activity. Since the reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment to produce the result, all measuring instruments must be calibrated by third party/ government agency for ensuring reliability of the system.

Monitoring, Reporting and Reviewing the GHG Parameters – Roles and Responsibilities
The project activity has a micro-processor based online data registration process through the control cabin.

Daily, monthly and yearly reports will be prepared stating the gross electricity generation and in-house electricity consumption by KSPL based on the data monitored by the Electrical Department of KSPL. Daily report on auxiliary consumption will also be prepared by the Electrical Department of KSPL.

The monthly report prepared by the Electrical Department of KSPL will be presented by General Manager in the morning meeting in presence of all the departmental manager heads and the review meeting conducted every three months. Discrepancies, if identified in the in-house operational system, will be addressed immediately.

The actual amount of CO_2 reduction however depends on the generation mix and production scenario of the grid that is taken into consideration in the grid emission factor calculation. The project does not have a direct control on the baseline. But since the baseline parameters like actual generation mix in million units and efficiency of thermal power plants in the grid will affect the actual emission reduction units that are attained during verification, they too will be included in the Monitoring and Verification procedure.

Central Electricity Authority (CEA) monitors the performance of all power generation units. The transmission and distribution network of Eastern Region includes monitoring and control facilities at each generation unit level, at each voltage level, substation level and consumer level. Hence, the transparency of measurements, recording, monitoring and control of the generation mix of the Eastern Regional Grid is ensured all the time.

The CEA report contains all information regarding type of generation like hydro, thermal etc., installed capacity, de-rated capacity, performance of generating unit, actual generation, capacity additions during the year, etc. which can be used for verification of the generation mix and emission factors for baseline calculation for a particular year.

The monitoring system, as discussed above, ensures proper quantification of the GHG emission reductions. At the same time, the monitoring system brings about the flaws in the system if any are identified and opens up the opportunities for improvement.

The General Manager of the plant is responsible for implementation of the Monitoring Plan and will have the authority to revise the monitoring plan in line with the methodology under infrastructural changes in the project activity and other associated operational systems.

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