CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

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## Revision history of this document

<table>
<thead>
<tr>
<th>Version Number</th>
<th>Date</th>
<th>Description and reason of revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>21 January 2003</td>
<td>Initial adoption</td>
</tr>
</tbody>
</table>
| 02             | 8 July 2005   | • The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.  
• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>. |
SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

>>
Energy Efficiency Improvement through replacement of Recuperative Heat Exchanger by
Regenerative Heat Exchanger in the Blast Furnace Section
Version – 01
Date: 21st August 2006

A.2. Description of the small-scale project activity:

>>

Background:
Tata Metaliks Limited (hereafter referred to as TML) is in the business of manufacturing Pig Iron, a major raw material for the foundry industry. It is a public limited company promoted by Tata Iron and Steel Company Limited (TISCO). Tata Korf Engineering Services was the technology consultant and KTS, Brazil was the technology supplier for setting up of TML facility. The TML facility, located at Kharagpur in West Bengal, India, has an installed capacity of 2 x 1,63,000 tonne of hot metal (thm) per annum and a waste gas based captive power generation unit. The pig iron manufacturing process is highly energy intensive and consumes both thermal and electrical energy.

Salient Features of Project Activity:
TML has undertaken an energy efficiency improvement measure in the one of its Mini Blast Furnace (MBF) by replacing existing metallic blast pre-heater (MBP) with a set of hot blast stoves (HBS) for preheating the atmospheric air. The pre-heated air is called hot blast. Metallic blast preheaters or MBPs work on the principle of recuperative heat transfer and due to inherent limitation of recuperative heat exchanger design of the MBPs, its average hot blast temperature has been around 750°C. On the other hand, HBS uses the principle of thermal regeneration where the average hot blast temperature is 1000 - 1050°C. The increase in temperature of hot blast due to change from recuperative heat exchanger to regenerative heat exchanger results in reduction of heat supplied by coke in the blast furnace. The project is estimated to reduce coke consumption by around 32 kg/tonne of hot metal produced leading to reduction in GHG emissions.

Purpose:
The basic objective of the project is to reduce energy consumption per tonne of Pig Iron production through implementation of energy efficient technologies. The company performed an internal energy audit study and the potential areas of improvements were identified. The study proposed the replacement
of existing MBPs, which are based on recuperative heating technology, with Hot Blast Stoves (HBS) that are based on the thermal regenerative heating principle, considering the potential benefits under CDM.

With the reduction in the thermal energy consumption, the project activity would result in considerable reduction in coke consumption and its associated CO$_2$ emissions.

The project activity’s contribution towards sustainable development has been detailed below under the following aspects of sustainable development:

**Environmental Well Being:** The project activity aims at reducing the specific thermal energy consumption of the pig iron manufacturing process. The project activity reduces the coke consumption per ton of pig iron. The reduction in coke consumption corresponds to an equivalent amount of reduction in the carbon dioxide emissions resulting from coke combustion in the Blast Furnace and from other activities like mining/transportation/conversion of coal/coke. These efforts result in the conservation of coal (a depleting reserve), which is a primary resource for power generation, and other metallurgical applications.

**Technological Well-being:** With the project activity, TML upgrades its core production process to an energy efficient and cleaner process. The technical skill and knowledge level of the employees of the organization is also enhanced. With the successful implementation of the project, there will be a possibility of replication in similar type of industries in India.

**Socio-economic Well Being:** The implementation of the project activity will lead to generation of direct and indirect employment to bankers, consultants and manufacturers during the design, erection and operation stage of the project.

### A.3. Project participants:

<table>
<thead>
<tr>
<th>Name of the Party involved</th>
<th>Private and/or public entity(ies) project participants(*) as applicable</th>
<th>Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Govt. of India (host)</td>
<td>Tata Metaliks Limited (Public Limited Company)</td>
<td>No</td>
</tr>
</tbody>
</table>
A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

India

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

West Bengal

A.4.1.3. City/Town/Community etc:

Kharagpur

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

The project activity is implemented in the MBF section of pig iron manufacturing plant of TML. The facility is located on National Highway # 6 at Gokulpur village, near Kharagpur town, district West Midnapore, West Bengal state, India. Kharagpur is around 120 km south-west of Kolkata, the state capital of West Bengal and is well connected by road and rail.
Fig1 – Location of Project Activity. Maps not to Scale
A.4.2. **Type and category(ies) and technology of the small-scale project activity:**

**Type and Category:**
The project activity is an energy efficiency improvement project that involves replacement of metallic blast pre-heaters with hot blast stoves in the mini blast furnace of pig iron manufacturing industry. The estimated energy savings of coke in the mini blast furnace from the project activity is of the order of 32 kg/tonne of hot metal with hot metal production of 1,63,000 tonnes per annum.

As the energy saving potential of the proposed project activity is around 33GWhₜ per year, which is less than stipulated 45GWhₜ (equivalent of 15 GWhₑ) every year, the project activity falls under the small scale CDM project activity as per Appendix B of the simplified modalities and procedures for small – scale CDM project activities of UNFCCC.

**Technology:**

The project activity includes energy efficiency and process improvement measures in the form of technology up-gradation in the old mini blast furnace of the plant.

TML operates the 215-m³ working volume mini blast furnace for the production of foundry grade and customized grade pig iron. Coke is fed in the MBF along with iron ore, manganese ore, limestone, dolomite and quartzite. Iron oxides in ore get reduced to iron due to reducing conditions and heat of combustion of coke inside the furnace forming ‘hot metal’. Upon solidification of hot metal in a Pig Casting Machine a solid lumpy product is obtained called ‘Pig Iron’.

The thermal energy requirement of the process is further supplemented with the hot blast. A pair of Metallic Blast Pre-heaters was installed as a part of the original plant design for hot blast injection to the furnace. The MBPs are low investment equipment operating at lower thermal efficiency of around 50%. These are recuperative heat exchangers capable of attaining hot blast temperature levels of around 650 - 750°C. TML was operating with MBPs since inception for the last ten years.

The project activity includes replacement of MBPs with Hot Blast Stoves (HBS) in the old MBF. HBS is a high investment equipment operating at higher thermal efficiency (of more than 80%). It is a reinforced heat-exchanging device, which conducts the heat to the cold blast to be heated. The HBS essentially employs the principle of thermal regeneration wherein during one cycle the refractory checker chamber of HBS is heated through combustion of waste gas (i.e. blast furnace gas). After transferring heat energy to
the passages in refractory checker chamber, the products of combustion flow into a common stack shared by all the stoves.

In the subsequent cycle, 31500 Nm$^3$/hr of cold blast enters the stove that has been previously heated and the heat stored in the refractory checker chambers inside the stove is transferred to the “cold blast” to generate “hot blast”. The hot blast temperatures range from 1000°C – 1050°C, as per the stove design and condition. This heated air then exits the stove into the "hot blast main", which runs up to the furnace.

The HBSs consist of a checker chamber with an eye shaped combustion chamber and a vertical ceramic burner. The HBSs are lined with suitable grades of fireclay & high alumina refractories (mainly alumina bricks) as working layer with two or more backup insulation layers. The refractory wall thickness is selected so as to ensure shell temperatures below 120°C. The different activities under the project activity include installation of hot blast stoves system, combustion air generation and handling system, cooling water supply system, cold blast piping, steam humidification system, waste gas system, stove heating up system, tuyere and tuyere stock modification.

Fig 2: TML’s process flow diagram
**A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:**

In the blast furnace operation, coke acts as a reducing agent and as a thermal energy source. The thermal energy requirement of the process is further supplemented with the injection of hot blast. The project activity which involves replacement of MBPs by the HBS, enhances the effectiveness of heat exchanging process in the hot blast section, resulting in an increase in the hot blast temperatures from 650–750°C to 1000-1050°C. This significant rise in sensible heat energy in the hot blast further reduces the thermal energy requirement in the MBF that was otherwise supplied through coke combustion. The project activity thus reduces specific coke consumption by 32 kg/tonne of hot metal produced and an equivalent amount of GHG emissions.

The estimated emission reduction due to the project activity would be around 1,26,440 tonnes of CO₂ equivalent over a 10 year crediting period. (refer to chapter E for detailed calculations)

The project activity would also reduce consumption of electrical energy required for Pig Iron production. However, as this electricity is produced in TML’s waste heat recovery based captive power plant with zero emissions, no emission reductions would accrue from the reduction in the electrical energy consumption.

The Indian Government or the Government of West Bengal does not have any mandates which require industries to implement energy efficiency projects similar to the project activity. Hence TML does not have any legal bindings to implement the project activity. The project activity is implemented over and above the national or sectoral requirements. The resulting GHG emission reductions will be additional to those directed by the government policies and regulations. The other ‘additionality’ criteria of the proposed project activity are dealt with in Section B.3.of the PDD.

**Technology transfer:**

There is no technology transfer from other countries involved in the project activity.
### A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

<table>
<thead>
<tr>
<th>Years</th>
<th>Annual Estimation of emission reductions in tonnes of CO$_2$ e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2007 – Mar 2007</td>
<td>3161</td>
</tr>
<tr>
<td>Apr 2007- Mar 2008</td>
<td>12644</td>
</tr>
<tr>
<td>2008-2009</td>
<td>12644</td>
</tr>
<tr>
<td>2009-2010</td>
<td>12644</td>
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<tr>
<td>2010-2011</td>
<td>12644</td>
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<td>2011-2012</td>
<td>12644</td>
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<tr>
<td>2012-2013</td>
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<td>2013-2014</td>
<td>12644</td>
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<tr>
<td>2014-2015</td>
<td>12644</td>
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<tr>
<td>2015-2016</td>
<td>12644</td>
</tr>
<tr>
<td>Apr 2016- Dec 2016</td>
<td>9483</td>
</tr>
<tr>
<td><strong>Total estimated reductions CO$_2$ e</strong></td>
<td><strong>126440</strong></td>
</tr>
<tr>
<td><strong>Total number of crediting years</strong></td>
<td><strong>10</strong></td>
</tr>
<tr>
<td><strong>Annual average over the crediting period of estimated reductions (tonnes of CO$_2$ e)</strong></td>
<td><strong>12644</strong></td>
</tr>
</tbody>
</table>

### A.4.4 Public funding of the small-scale project activity:

No public funding from parties belonging to Annex – I country is available to the project activity.
### A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

The project proponent hereby confirms that the proposed project activity is not a debundled component of a larger project activity. Neither is a project activity registered nor there is an application to register another small scale CDM project activity:

- From the same project participant
- In the same project category and technology/measure and
- Registered within the previous 2 years, and
- Whose project boundary is within 1 km of project boundary of the proposed small scale activity at the closest point.

### SECTION B. Application of a baseline methodology:

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

Title: ‘Energy Efficiency and fuel switching measures for industrial facilities’


### B.2 Project category applicable to the small-scale project activity:

Small scale category II.D is applicable for any energy efficiency and fuel switching measure implemented at a single industrial facility. This category covers project activities aimed primarily at energy efficiency. The measures may replace existing equipment or be installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 15 GWhₑ per year. A total saving of 15 GWhₑ per year is equivalent to a maximal saving of 45 GWhₜ per year in fuel input.

TML has undertaken an energy efficiency improvement measure the Mini Blast Furnace (MBF) by replacing existing metallic blast pre-heater (MBP) with a set of hot blast stoves (HBS) for preheating the atmospheric air. The estimated energy savings of the project is around 33 GWhₜ, which is less than the stipulated limit of 45 GWhₜ (equivalent of 15 GWhₑ).

Thus, the project activity meets the applicability conditions of Category II.D of Appendix B of Simplified M & P of small scale CDM Project Activities.
The methodology is applied in the context of the project activity as follows:

I. Estimation of Baseline Emissions and Emission Reductions:
As per the methodology, the energy baseline consists of the energy use of the existing equipment that is replaced in the case of retrofit measures and of the facility that would otherwise be built in the case of a new facility. The existing hot blast generating equipment before the implementation of the project at the mini blast furnace of TML was MBP which is being retrofitted with a set of HBS.

The efficiency improvement in hot blast generation process leads to increase in temperature, and hence net increase in hot blast enthalpy supplied (i.e. output). This in turn leads to corresponding reduction in coke consumption in the blast furnace. Thus, the increase in temperature of hot blast generated is the only parameter determining the emission reductions of the project.

The power requirement for TML is met by waste gas based captive power plant (CPP). For power drawn from waste gas based CPP, the CO₂ emission factor is taken as zero. Hence, there is no change in GHG emissions due to electricity implementation of the project activity.

Details of estimation emission reductions have been provided in Section B.5 and Section E of the PDD.

II. Determination of Project Boundary:
As per the methodology, the project boundary is the physical, geographical site of the industrial facility, processes or equipment that are affected by the project activity. Please refer Section B.4. of the PDD for details.

III. Additionality: The additionality aspects for the project activity have been discussed in accordance with Attachment A to Appendix B in Section B.3. of the PDD.

IV. Monitoring: The detailed Monitoring plan for the project activity is provided in Section D of the PDD.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Justification of applying simplified methodology to the project activity:
Please refer section B.2 above for details.

Project Additionality:
The additionality aspects of the project are discussed below in accordance with Attachment A of Appendix B of the simplified M & P for small scale CDM project activities.
Technological Barrier:

The activity involves high risk of operational failure as blast furnaces with working volume less than 300m$^3$ are recommended with metallic recuperators. TML’s MBF has been working for almost a decade and the system is balanced for optimum design production. A change in blast temperature and volume would certainly create an imbalance and affect the metallurgical and structural stability of the existing designed system. The flow of material would be changed and accordingly the entire material handling system, reduction rate, flow rate, cooling system, gas cleaning system have to be augmented. The furnace characteristics would be changed once the entire system comes into operation. The technology adopted being new to the project proponent, the investment made involved higher risks in comparison with capacity expansion plans to meet the demand and avail the benefit of economy of scale. However, TML decided to go ahead with the implementation of the project activity despite being aware of possible disruption in production and loss in market share.

Investment Barrier

The company had taken the decision to implement the project activity in spite of its poor financial performance during the past 5-6 years when the whole of steel industry was facing financial instability due to recession in the steel sector. The company invested over Indian Rupees (INR) 99.2 Million on the project activity despite its poor economic health.

In a capital scarce country like India, capital intensive industries generally focus on reducing capital costs rather than being concerned about the energy inputs that hold low shares in overall input costs. Lack of dissemination of information on energy-efficient technologies as well as specific information on benefits of energy savings further contribute to the reluctance to improve energy efficiency.

Prevailing practice barrier:

In the secondary pig iron manufacturing sector of India with similar socio-economic environment, geographic conditions and technological circumstances there are 17 similar pig iron plants$^1$. During the project conception phase in 2003, TML was one of the first few plants in India to implement the Hot Blast Stoves Project for a Mini Blast Furnace of capacity 215m$^3$ working volume with an objective of enhancing the efficiency of Blast Furnace operation. This shows that there is poor penetration of this technology in India due to economic unattractiveness of the project and its implementation would not have happened in the absence of CDM.

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Other barriers:
Successful implementation and running of the project activity on a sustainable basis requires continuous investments in technological upgradation. It also requires manpower training and skill development on a regular basis. The project proponent could get the necessary funding from selling the project related CERs. Further CDM fund will provide additional coverage to the risk due to failure of project activity; shut down of plant and loss of production in TML.

National Policy: As mentioned above in Section A 4.3, there is no mandate by National/ State Government or its agencies to implement this energy efficiency project in blast furnace operation of pig iron manufacturing industries.

From the above discussion, it is ascertained that the project activity would not have occurred in the absence of the CDM simply because no sufficient financial, policy, or other incentives exist locally to foster its development in West Bengal /India and without the proposed carbon financing for the project the TML would not have taken the investment risks in order to implement the project activity. Therefore the project activity is additional. Also, the impact of CDM registration is significant with respect to continuity of the project activity on a sustainable basis.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

According to the project boundary is the physical, geographical site of the industrial facility, processes or equipment that are affected by the project activity. The project activity concerns only efficiency improvement in hot blast generation at TML. Hence, the spatial extent of project boundary ranges from input terminals to the output terminals of MBP and HBS respectively, together with their auxiliaries, as shown in figure below. Further, since the project activity indirectly leads to coke savings in hot metal production, the blast furnace operation itself has not been considered as a part of project boundary.
Fig. 3: Project Boundary

MBF

Waste Gas

Hot blast

Preheater section

Flue Gas

Primary air

Hot metal

Hot Blast Generation Equipment with auxiliaries (MBP/HBS)

Blast Furnace Gas

Combustion Air

Cold Blast

Hot Blast

Flue gas out

Project Boundary

Raw material In
B.5. Details of the baseline and its development:

As all other operating parameters for hot blast generation in the project scenario would be the same as baseline scenario, the only parameter affecting baseline determination is the temperature of hot blast. Details of baseline determination are provided in Section E of the PDD.

Date of completing the final draft of this baseline selection: 21/08/2006

Name of person/entity determining the baseline:

Tata Metaliks Limited (the project participant as listed in Annex-1 of the PDD)

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

C.1.1. Starting date of the small-scale project activity:

March 2003

C.1.2. Expected operational lifetime of the small-scale project activity:

15y 0m

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

C.2.1. Renewable crediting period:

Not Applicable

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

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:
01/01/2007 (post registration)

C.2.2.2. Length:

10y 0m

SECTION D. Application of a monitoring methodology and plan:

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

Title: ‘Energy Efficiency and fuel switching measures for industrial facilities’


D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

Please refer Section B.2. above for justification of the choice of methodology and its applicability to project activity.

Description of Monitoring Plan

As per Appendix B of the simplified M&P for small-scale CDM project activities, for industrial energy efficiency projects falling under Category II.D, in the case of retrofit measures, monitoring shall consist of:

(a) Documenting the specifications of the equipment replaced;

(b) Metering the energy use of the industrial facility, processes or the equipment affected by the project activity;

(c) Calculating the energy savings using the metered energy obtained from sub-paragraph ‘(b)’

As regards to monitoring, for TML project activity, records of accurate heat and mass balance parameters are available for both metallic blast pre-heater and hot blast stove operation. The technical information for calculating the baseline and project emissions are obtained from Revised 1996 IPCC Guidelines and Handbooks from Bureau of Energy Efficiency, Government of India.
Further, the power requirement for TML is met by waste gas based captive power plant (CPP). For power generation from waste gas based CPP, the CO$_2$ emission factor is considered as zero. Hence, there is no change in GHG emissions due to electricity implementation of the project activity.
D.3 Data to be monitored:

<table>
<thead>
<tr>
<th>ID number</th>
<th>Data variable</th>
<th>Source of data</th>
<th>Data unit</th>
<th>Measured (m), calculated (c) or estimated (e)</th>
<th>Recording frequency</th>
<th>Proportion of data to be monitored</th>
<th>How will the data be archived? (electronic/paper)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: Metallic Blast Pre-heater (MBP)</td>
<td>1. $T_n$ Temperature of hot blast at the outlet of MBP</td>
<td>Plant log book</td>
<td>$^\circ$C</td>
<td>M</td>
<td>Daily</td>
<td>100%</td>
<td>Electronic/Paper</td>
<td>In normal operation of plant the values will be almost consistent. Measured data of equipment for one year before project implementation</td>
</tr>
<tr>
<td>2. $T_{MBP}$ Average annual temperature of hot blast</td>
<td>Plant Log book</td>
<td>$^\circ$C</td>
<td>C</td>
<td>Once at the start of crediting period</td>
<td>100%</td>
<td>Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project: Hot Blast Stoves</td>
<td>3. $Q_{\text{in},y}$ Average Volume of hot blast</td>
<td>Onsite measurement</td>
<td>Nm$^3$/hr</td>
<td>M</td>
<td>Daily</td>
<td>100%</td>
<td>Electronic / Paper</td>
<td></td>
</tr>
<tr>
<td>4. $T_{\text{HBS},y}$ Temperature of hot blast at the outlet of HBS</td>
<td>Onsite measurement</td>
<td>$^\circ$C</td>
<td>M</td>
<td>Daily</td>
<td>100%</td>
<td>Electronic / Paper</td>
<td>In normal operation of plant the values will be almost consistent</td>
<td></td>
</tr>
<tr>
<td>5. $D\text{EN}_{\text{hot blast},y}$ Density of hot blast</td>
<td>Data books, technology supplier manuals / calculations</td>
<td>kg/m$^3$</td>
<td>E</td>
<td>Daily</td>
<td>100%</td>
<td>Electronic / Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. $C_p,\text{ hot blast},y$ Specific heat of hot blast</td>
<td>Data books, technology supplier manuals / calculations</td>
<td>kCal/kg $^\circ$C</td>
<td>E</td>
<td>Daily</td>
<td>100%</td>
<td>Electronic / Paper</td>
<td>Based on Temperature of hot blast supplied</td>
<td></td>
</tr>
<tr>
<td>Emission Reductions</td>
<td>7. $\text{ENT}_{\text{project},y}$ Net Increase in Enthalpy of hot blast due to project activity</td>
<td>Plant Log</td>
<td>kCal/day</td>
<td>C</td>
<td>Daily</td>
<td>100%</td>
<td>Electronic / Paper</td>
<td></td>
</tr>
<tr>
<td>8. $\text{NCV}_{\text{coke},y}$ Net Calorific Value of Coke</td>
<td>Plant</td>
<td>kCal/kg</td>
<td>E</td>
<td>Annually</td>
<td>100%</td>
<td>Independent Lab test reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. $F_{\text{coke},y}$ Equivalent coke saved</td>
<td>Plant log</td>
<td>tonnes/annum</td>
<td>C</td>
<td>Annually</td>
<td>100%</td>
<td>Electronic/Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. $E_{\text{coke}}$ Emission Factor of coke used in Blast Furnace</td>
<td>IPCC</td>
<td>tC/TJ</td>
<td>Standard</td>
<td>Annually</td>
<td>100%</td>
<td>Electronic/Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. $\text{OXID}_{\text{coke}}$ Oxidation factor of coke</td>
<td>IPCC</td>
<td>%</td>
<td>Standard</td>
<td>Annually</td>
<td>100%</td>
<td>Electronic/Paper</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

<table>
<thead>
<tr>
<th>Data (Indicate table and ID number e.g. 1.,-11.)</th>
<th>Uncertainty level of data (High/Medium/Low)</th>
<th>Are QA/QC procedures planned for these data?</th>
<th>Outline explanation why QA/QC procedures are or are not being planned.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.,-2.</td>
<td>Low</td>
<td>Yes</td>
<td>This data will be used for estimating the baseline parameters</td>
</tr>
<tr>
<td>3.,-6.</td>
<td>Low</td>
<td>Yes</td>
<td>This data is will be used for HBS parameters</td>
</tr>
<tr>
<td>7.,</td>
<td>Low</td>
<td>No</td>
<td>This data is calculated to estimate the net increase in enthalpy supplied by HBS</td>
</tr>
<tr>
<td>8.</td>
<td>Low</td>
<td>Yes</td>
<td>This data will be obtained from independent laboratory test reports</td>
</tr>
<tr>
<td>9.</td>
<td>Low</td>
<td>No</td>
<td>This data is calculated.</td>
</tr>
<tr>
<td>10.,-11.</td>
<td>Low</td>
<td>No</td>
<td>Data from Revised 1996 IPCC Guidelines are considered.</td>
</tr>
</tbody>
</table>

Note on QA/QC: The parameters related to the performance of the project will be monitored using meters and standard testing equipment, which will be regularly calibrated following standard industry practices.
D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

>>

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

D.6. Name of person/entity determining the monitoring methodology:

>>

Tata Metaliks Limited (the project participant as listed in Annex-1 of the PDD) and its associated consultants.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

E.1.1 Selected formulae as provided in appendix B:

>>

Not Applicable

E.1.2 Description of formulae when not provided in appendix B:

>>

The project activity involves replacement of metallic blast pre-heater with hot blast stoves in a mini blast furnace at TML. The project activity leads to increase in hot blast temperature resulting in reduction in coke consumption in the blast furnace operation.

Procedure and formulae used for estimation of the anthropogenic emissions by sources of greenhouse gases of the baseline and GHG reduction units from project activity are provided in the sections below.

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>

As mentioned earlier, the efficiency improvement in hot blast generation process leads to increase in temperature, and hence the net increase in hot blast enthalpy supplied (i.e. output). This in turn leads to corresponding reduction in coke consumption in the blast furnace. Thus, the increase in temperature of hot blast generated is the only parameter determining the emission reductions of the project.
In section E.1.2.5 below, based on the measured parameters in the project, a consolidated formulae has been used to estimate differential increase in net enthalpy supplied to the blast furnace considering both the baseline and project scenario.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Since, Hot Blast Stove set installed in the project activity is new (i.e. not transferred from another activity) and the existing equipment has been dismantled completely (i.e. not transferred to another activity), there is no leakage associated with the project activity.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

Please refer to Section E.1.2.5 for consolidated procedure and formulae to estimate emission reductions from project activity.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

As all other operating parameters for hot blast generation in the project scenario would be the same as baseline scenario, the only parameter affecting baseline determination is the temperature of hot blast.

Average annual temperature of hot blast in MPB is obtained from daily measured data for one year period before implementation of the project activity as follows.

\[ T_{MPB} = \frac{(\Sigma T_a)}{n} \]

where,

- \( T_{MPB} \) = Average annual temperature of hot blast at output of MBP (°C)
- \( T_a \) = Temperature of hot blast at output of MBP (°C)
- \( n \) = number of operation days of MBP in the base year under consideration.

The emission reduction has been estimated considering the baseline scenario and project scenario. Procedure and formulae for the same has been provided in Section E.1.2.5 below.
E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

The project activity leads to increase in temperature of hot blast and hence a net increase in enthalpy of hot blast supplied to blast furnace. This implies that the difference in hot blast supplied of HBS over MBP is the only parameter affecting the increase in net enthalpy of hot blast. Further, the enhanced heat supplied by hot blast results in corresponding reduction in coke consumption in blast furnace operation leading to GHG emission reductions. Procedure and formulae for estimating the emission reductions considering the baseline and project scenario has been provided below:

1. \[ \text{DEN}_{\text{hot blast},y}^2 = \frac{273 \times 1.293}{(273 + T_{\text{HBS},y})} \]
   where,
   \( \text{DEN}_{\text{hot blast}} \) = Density of hot blast at the outlet of HBS in project year \( y \) (kg/m\(^3\))
   \( T_{\text{HBS}} \) = Daily temperature of hot blast at the outlet of HBS in project year \( y \) (°C)

2. \[ \text{ENT}_{\text{project,}y} = \frac{Q_{\text{HBS},y} \times 24 \times \text{DEN}_{\text{hot blast},y} \times C_{p, \text{hot blast},y} \times (T_{\text{HBS}} - T_{\text{MBP}})}{\text{DEN}_{\text{hot blast},y}} \]
   where,
   \( \text{ENT}_{\text{project,}y} \) = Net addition in enthalpy due to project activity on day \( n \) of project year \( y \) (kCal/day)
   \( Q_{\text{HBS},y} \) = Volume of hot blast supplied from HBS (Nm\(^3\)/hr)
   \( \text{DEN}_{\text{hot blast}} \) = Density of hot blast at the outlet of HBS (kg/m\(^3\))
   \( C_{p, \text{hot blast}} \) = Specific heat of hot blast at the outlet of HBS (kCal/kg)
   \( T_{\text{MBP}} \) = Average annual temperature of hot blast at output of MBP (°C)

3. \[ F_{\text{coke,}y} = \left[ \sum \text{ENT}_{\text{project,}y} / (\text{NCV}_{\text{coke,}y} \times 1000) \right] \]
   where,
   \( F_{\text{coke,}y} \) = Equivalent coke saved in year \( y \) (tonnes)
   \( \text{NCV}_{\text{coke}} \) = Net calorific value of coke in year \( y \) (kcal/kg)

4. \[ \text{ER}_y = F_{\text{coke,}y} \times 1000 \times \text{NCV}_{\text{coke,}y} \times (4.179/10^9) \times \text{EF}_{\text{coke}} \times (44/12) \times \text{OXID}_{\text{coke}} \]
   where,
   \( \text{ER}_y \) = CO\(_2\) Emission reductions due to project activity (tCO\(_2\)/annum)
   \( F_{\text{coke,}y} \) = Equivalent coke saved in year \( y \) (tonnes)
   \( \text{NCV}_{\text{coke}} \) = Net calorific value of coke in year \( y \) (kcal/kg)

\(^2\) Source: Bureau of Energy Efficiency handbook, Govt. of India.
4.179/10^9 = kcal to TJ conversion ratio

\[ EF_{\text{coke}} = \text{Carbon Emission factor of coke (tC/TJ)} \]

\[ OXID_{\text{coke}} = \text{Oxidation factor of coke (\%)} \]

E.2 Table providing values obtained when applying formulae above:

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimation of Emission Reductions (tonnes of CO₂e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2007 – Mar 2007</td>
<td>3161</td>
</tr>
<tr>
<td>Apr 2007- Mar 2008</td>
<td>12644</td>
</tr>
<tr>
<td>2008-2009</td>
<td>12644</td>
</tr>
<tr>
<td>2009-2010</td>
<td>12644</td>
</tr>
<tr>
<td>2010-2011</td>
<td>12644</td>
</tr>
<tr>
<td>2011-2012</td>
<td>12644</td>
</tr>
<tr>
<td>2012-2013</td>
<td>12644</td>
</tr>
<tr>
<td>2013-2014</td>
<td>12644</td>
</tr>
<tr>
<td>2014-2015</td>
<td>12644</td>
</tr>
<tr>
<td>2015-2016</td>
<td>12644</td>
</tr>
<tr>
<td>Apr 2016- Dec 2016</td>
<td>9483</td>
</tr>
<tr>
<td>Total (for ten years)</td>
<td>126440</td>
</tr>
</tbody>
</table>

Please refer enclosure for detailed calculation.

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

TML, as part of its Corporate Environmental Policy, is committed to systematic and progressive reduction in losses and for preservation and development of the environment by reduction in pollution in all its forms and nurturing the ecosystem within and outside the organization. The project proponent follows and obeys all relevant statutory norms of state as well as central government and all required parameters are monitored by West Bengal Pollution Control Board.

The environmental impacts of the project activity are discussed as under:

Air: With the decrease in specific coke consumption for pig iron production post implementation of the project activity, there will be a reduction in the burning rate of coke and hence a reduction in the level of SOx, NOx gases and suspended particulate matter (SPM) discharged to the atmosphere. The stack height will be increased from 30 m to 45 m to avoid any adverse effects due to increase BF gas firing rate.
TML maintains its stack emission below the stipulated norms of Central and state pollution control boards. It regularly monitors the stack emission and ambient air quality to ensure a safe working environment for its employees.

**Land:** The project does not have adverse impact on soil. The land used by TML is allocated as an industrial land and does not constitute rich diversity. The factory covers around 200 acres of land, of which 100 acre land has been used for green belt development and for water harvesting.

Wastes generated like sludge from gas cleaning plant and iron ore fines are used for land filling of low land and construction of road base. Slag is granulated and sold as a by-product to nearby cement manufacturing units.

**Water:** The project activity does not lead to any additional consumption of water. TML uses ground water to run its pig iron manufacturing process. For optimal use of ground water TML reuses wastewater, which is collected in a pond and used in the area of scrap cooling and gardening where water quality is not of much importance.

TML collects process effluent water in a tank. The waste water is recycled to the Mini Blast Furnace cooling, power house cooling system, Gas Cleaning Plant and process scrap handling system.

**Noise:** Noise is kept under control by adopting comprehensive preventive maintenance scheme for all rotary equipments, providing padding to prevent vibrating and rattling, providing noise proof cabins to operators and by using ear muffs. The equipments used in the project will be designed and other noise abatement measures will seriously be taken in such a way so as to keep the noise level below 85 to 90 db(A) as per the requirement of Occupational Safety and Health Administration (OSHA) Standards.

The project activity is not polluting and the impacts associated with the project activity are insignificant. Environmental Clearance documents from relevant Government Departments are available with the project proponent which can be shown on request.

### SECTION G. Stakeholders’ comments:

#### G.1. Brief description of how comments by local stakeholders have been invited and compiled:

TML is implementing an energy efficiency measure in its blast furnace operations by installing Hot Blast stoves to replace the existing Metallic Blast pre-heaters at their pig iron manufacturing facility in Kharagpur, West Bengal.

The stakeholders identified for the project are as under:

- Elected body of representatives administering the local area (village *Panchayat*)
Local Non-Governmental Organisations (NGOs)
Ministry of Non Conventional Energy Sources (MNES)
West Bengal Pollution Control Board
Shareholders of TML
Consultants
Equipment Suppliers
Customers

For implementing the project activity, TML communicated to the relevant stakeholders. The stakeholders’ responses will be documented before validation process.

TML also maintains a continuous consultation process with the local governing and non-governing body and considers their opinions and suggestion at all stages of development.

G.2. Summary of the comments received:

TML has received positive feedback from the local authorities and employees on the project activity. The roles of the local people are as the beneficiary of the project. The project will not cause any disturbance to the ecological characteristics of the area. On the contrary, it would lead to reduction in release of emissions leading to better environment for the employees and the surrounding community. In addition, it would provide employment to the locals during construction and operation phase of the project. The local populace thus holds positive opinion about the project. Comments from other local stakeholders are expected.

Further, through regular interaction with the local authorities like District Magistrate, Block Development Officer, Panchayat Pradhan and Deputy Labour Commissioner, TML has received their comments on the project activity implementation. These comments are all in positive in nature.

West Bengal Pollution Control Board (WBPCB) and Environment Department of Government of West Bengal have prescribed standards of environmental compliance and monitor the adherence to the standards. The project has received the Consent to Establish (or No Objection Certificate (NOC) from WBPCB before the commissioning of the project.

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

The relevant comments and important clauses mentioned in the project documents/clearances like Detailed Project Report (DPR), environmental clearances, local clearance, etc. were considered while preparation of CDM project development document.
The TML representatives have met the various stakeholders for appraisal and support. TML was commended for the voluntary action toward environmental protection and socio-economic development. Further, as per UNFCCC requirement this Project Design Document (PDD) will be published at the validator’s web site for public comments.

**Annex 1**

**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

<table>
<thead>
<tr>
<th>Organization:</th>
<th>Tata Metaliks Limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street/P.O.Box:</td>
<td>P.O. Samraipur,</td>
</tr>
<tr>
<td>Building:</td>
<td>-</td>
</tr>
<tr>
<td>City:</td>
<td>Kharagpur, West Midnapore</td>
</tr>
<tr>
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<td>Postfix/ZIP:</td>
<td>721301</td>
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<tr>
<td>Country:</td>
<td>India</td>
</tr>
<tr>
<td>Telephone:</td>
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</tr>
<tr>
<td>FAX:</td>
<td>+91-3222-233316</td>
</tr>
<tr>
<td>E-Mail:</td>
<td>-</td>
</tr>
<tr>
<td>URL:</td>
<td><a href="http://www.tatametaliks.com">www.tatametaliks.com</a></td>
</tr>
</tbody>
</table>

Represented by:

| Title: | Head of Works |
| Salutation: | Mr. |
| Last Name: | Misra |
| Middle Name: | - |
| First Name: | Debasis |
| Department: | Works |
| Mobile: | - |
| Direct FAX: | - |
| Direct tel: | +91-3222-234254 |
| Personal E-Mail: | debasish.misra@tatametaliks.co.in |

**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

Till now funding from any Annex I country is not available for the project activity.