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

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## SECTION A. General description of project activity

## A.1. Title of the project activity:

GHG emission reductions through waste gas based power generation at Visa Steel Limited

Version: 03

Date: 30/12/2008

## A.2. Description of the project activity:

Visa Steel Limited belongs to the Visa Group which has a decade long experience in the minerals and metals industry with a strong global presence in countries including India, China, Australia, Indonesia, Switzerland, UK and Hong Kong. They have their registered office in Bhubaneswar and corporate office in Kolkata with branch offices across India. Visa Steel Limited is in the process of setting up an integrated iron and steel plant at Kalinganagar in Orissa. The integrated steel complex will consist of Sponge Iron Kilns, Coke Ovens, Blast Furnace, Steel Melting Shop, Rolling Mills, Ferro Chrome unit and other ancillary facilities.

The integrated iron and steel plant of Visa Steel Limited comprises of two Direct Reduction Iron kilns (DRI kilns) of 500 tonnes per day (TPD) capacity each, a Mini Blast Furnace of 2,27,500 tonnes per annum (TPA) capacity and Coke Ovens of 4,00,000 tonnes per annum (TPA) capacity. Operation of DRI kilns, Mini Blast Furnace and Coke Ovens will generate by-product gases (such as DRI kiln gas, Blast Furnace Gas (BFG) and Coke Oven Gas (COG)) with substantial heat content. The project activity envisages utilization of the heat content of these by-product gases for generation of around 43.7 MW of power. The power thus generated will partially cater to the electrical energy requirement of the integrated iron and steel plant of Visa Steel Limited.

In absence of the project activity, the DRI kiln gas and the Coke Oven gas would have been combusted and emitted into the atmosphere. Similarly the Blast Furnace Gas would have been flared into the atmosphere. This would have led to wastage of the heat energy content of the by-product gases. The power, under such a circumstance, would have been generated in a captive coal based power plant[1]. The project activity will therefore prevent wastage of useful energy, utilize it effectively for power generation and replace an equivalent quantum of power from a more carbon intensive source (*i.e.* coal based captive power plant) resulting in an overall reduction of Greenhouse Gas (GHG) emissions.

With an annual availability of 300 days of the DRI kilns and 325 days of the Mini Blast Furnace and the Coke Ovens, the project activity is expected to generate 328629MWh of electrical energy per annum. After catering to the auxiliary power requirement of the power plant equipment, around 295766 MWh of

[1] Please refer to Section B.4 of the Project Design Document for details on identification of baseline scenario.

electrical energy (net electrical energy generated with by-product gases) will be available annually to cater to the power demand of the integrated iron and steel plant of Visa Steel Limited. In absence of the project activity the same electrical energy would have been generated by a coal based captive power plant. Therefore the project activity will replace generation of around 295766 MWh of electrical energy per annum from the coal based captive power plant and will eliminate emission of 341077 tonnes of $CO_2$ per annum amounting to a total of about 3410770 tonnes $CO_2$ of over the entire crediting period of 10 years.

The project activity will contribute to 'Sustainable Development of India' – the same is elaborated below:

| Table-A.1: Project's Contribution to Sustainable Development |
|---|
| Social Well-being |
| The project activity will generate employment opportunities for the rural population of Orissa in the process of implementation of the power plant and for its operation and maintenance activities. This will help in improving the social status of the local people in and around the plant site as well as improving their operating skills thereby benefiting them in the long run. Furthermore, implementation of the project activity will not require any dislocation of local population. Over and above, India, being a power deficit country, the power generated by the project activity will actually cater to the growing demand of electricity thereby leading to a better power balance scenario. |
| Technological Well-being |
| Conservation of Natural Resource-Coal: In the context of generation of thermal power, India is still very much reliant on the use of coal as the primary fuel. Thermal power plants are the major consumers of coal in this country. The project activity will contribute towards reduction in the use (or demand) of coal as a finite global resource thereby minimizing depletion or else increasing its availability to other important applications.<br>Conservation of energy through clean power generation: The project activity will involve utilization of the heat content of the DRI kiln gas, Blast Furnace Gas and Coke Oven Gas for power generation. In absence of the project activity, the thermal energy content of the by-product gases would have been wasted. Power generation with by-product gases will not cause any significant increase in the air pollution in comparison to generation of power with fossil fuels. Therefore the project activity will lead to conservation of thermal energy and utilization of the same for generation of clean power. |
| Environmental Well-being |

| Table-A.1: Project's Contribution to Sustainable Development |
|---|
| In absence of the project activity, the DRI kiln gas, Blast Furnace Gas and Coke Oven Gas would have been emitted to the atmosphere, thus creating thermal pollution of the local environment. The project activity will reduce the thermal load of the local environment to a great extent by recovering and effectively utilizing the heat content of these by-product gases. Furthermore it will replace fossil fuel based power generation thereby reducing the emissions of $SO_x$, $NO_x$ and particulates. The project activity is a GHG abatement project which will reduce the generation of Greenhouse Gases (primarily $CO_2$) resulting from fossil fuel based power generation and hence is an initiative to combat global warming. |
| Economical Well-being |
| The project activity has also created business opportunities for contractors, consultants and suppliers. Therefore it has resulted in an overall economic improvement of the locality and the country as a whole. Moreover, by reducing the dependency on coal based power generation, the project activity will make coal available for other usages which in turn will lead to an overall economic progress of India. |

## A.3. Project participants:

| Name of the 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 proponent(Yes/No) |
|---|---|---|
| Ministry of Environment and Forests (MoEF), Government of India (Host) | Visa Steel Limited | No |

## A.4. Technical description of the project activity:

### A.4.1. Location of the project activity:

| A.4.1.1. | Host Party(ies): |
|---|---|

India

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

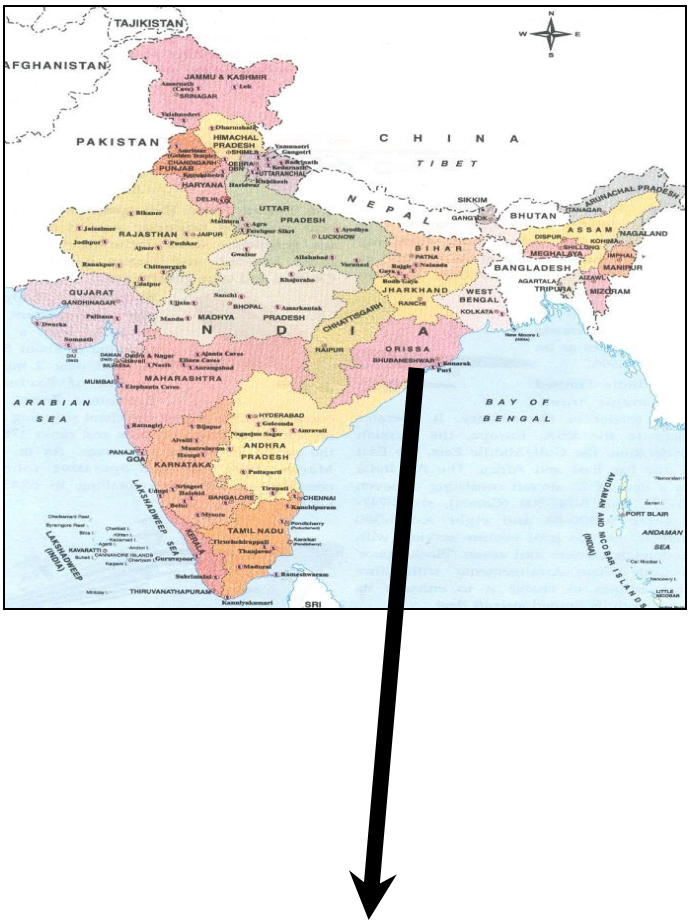
Orissa

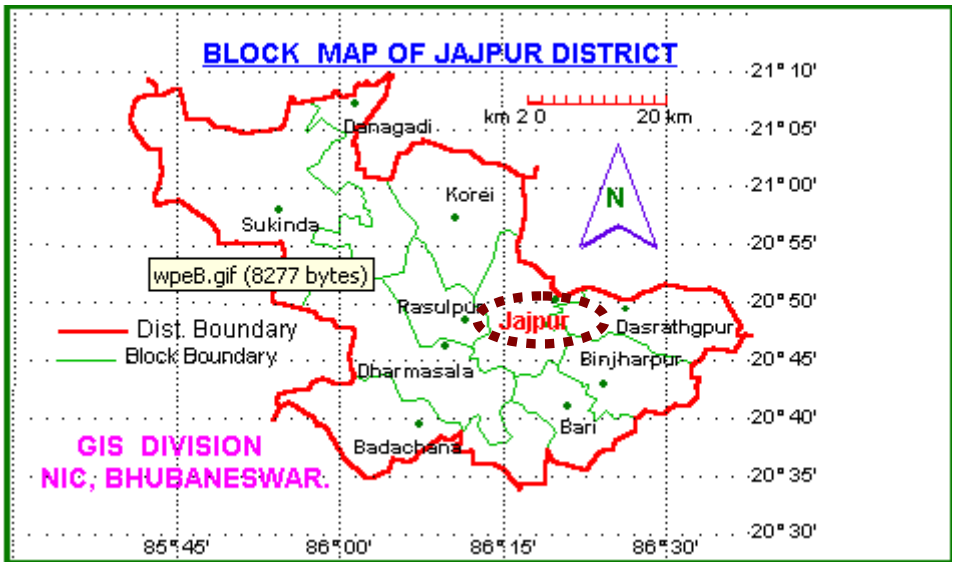
| A.4.1.3. | City/Town/Community etc.: |
|---|---|

Kalinganagar, Duburi, Jajpur.

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

The power plant will be located within the iron and steel manufacturing facility of Visa Steel Limited at Kalinganagar in the Industrial Complex of Duburi of Jajpur district, Orissa. Jajpur district is located at a latitude of $20^0$51'N and longitude of $86^0$20'E. The plant site is well connected by national highways and rail-routes. Closest airport is located at Bhubaneshwar which is 123 km from Jajpur. The site is strategically located close to the raw material sources and other infrastructural facilities. The nearest port is at Paradeep town located 120 km from the plant site.






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

As per the "Sectoral scopes related to approved methodologies and DOEs, the recommended Sectoral scope (s) for the project activity is

(1) Energy industries (renewable -/ non-renewable sources) and

(4) Manufacturing Industries

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

The project activity entails utilization of the heat content of the by-product gases for generation of steam and subsequently power. The same is facilitated as explained below:

Stage-I: Recovery and Utilization of heat content of the by-product gases for steam generation

Under normal operational condition, an estimated 1,00,000 $Nm^3$/hr of DRI kiln gas will be available from each of the two DRI kilns. As per the conventional sponge iron manufacturing process, the gas emanating from DRI kiln is introduced into an After Burning Chamber (ABC) to ensure complete combustion. In the project scenario, the DRI kiln gas, after complete combustion in the ABC, will be introduced into two Waste Heat Recovery Boilers (WHRBs) where the heat content of the DRI kiln gas will be extracted and utilised for generation of steam. The project activity involves installation of two numbers unfired, single drum, top supported natural circulation type WHRBs, each connected to the respective DRI kilns. The super-heater of the WHRBs will be arranged in two stages with a spray type de-super heater in between to control the steam temperature. Proper arrangements for integral piping and flue gas ducting will also be

designed in the WHRBs. In the process of heat extraction and its utilization, the DRI kiln gas will be cooled to a temperature of around 170°C which will then be introduced into the Electrostatic Precipitator (ESP) and finally released to the atmosphere. The technical specifications of the WHRBs are provided below:

| Table-A.2: Technical specifications of WHRBs for DRI kiln gas | | |
|---|---|---|
| Parameter | Unit | Value |
| Steam output maximum continuous rating (MCR) | Tonnes per Hour (TPH) | 48 |
| Steam pressure at super heater outlet | $kg/cm^2$ | 67 |
| Steam temperature at super heater outlet | $^0C$ | 490 |
| Feed water temperature at economizer inlet | $^0C$ | 130 |
| DRI kiln gas flow at inlet | $Nm^3/hr$ | 1,00,000 |
| Gas temperature | $^0C$ | 950 |
| Dust Content at outlet of ESP | $g/Nm^3$ | 50 |
| Exit Temperature of DRI kiln gas | $^0C$ | 170 |

Similarly the operation of Mini Blast Furnace will generate around 55,000 $Nm^3/hr$ of Blast Furnace Gas (BFG) under normal operational condition. After catering to the in-plant requirement, there will be a surplus of around 25,000$Nm^3/hr$ of BFG which will be used for power generation in the project scenario. The BFG, after being cleaned, is fired in an external combustor for complete combustion. The hot flue gas will then be introduced in a BFG boiler for generation of steam. The flue gas from the BFG boiler will be released to the atmosphere through a stack connected to the boiler. The technical specifications of the BFG boiler are provided below:

| Table-A.3: Technical specifications of BFG Boiler | | |
|---|---|---|
| Parameter | Unit | Value |
| Steam output maximum continuous rating (MCR) | Tonnes per Hour (TPH) | 30 |
| Steam pressure at super heater outlet | $kg/cm^2$ | 67 |
| Steam temperature at super heater outlet | $^0C$ | 490 |
| Feed water temperature at economizer inlet | $^0C$ | 126 |
| BFG flow at inlet | $Nm^3/hr$ | 25,000 |
| Gas temperature | $^0C$ | 60 |
| Dust Content outlet of ESP | $g/Nm^3$ | N.A |
| Exit Temperature of BFG | $^0C$ | 120 |

The project activity will also utilize the heat content of the Coke Oven Gas (COG) emanating from eight non-recovery type coke oven batteries in four Waste Heat Recovery Boilers (WHRBs). Each Coke Oven Batteries will comprise of eleven ovens resulting in total emission of around 174789 $Nm^3/hr$ of COG (from all the eight coke oven batteries) at a temperature of $950^0C$. The same will then be introduced into

Waste Heat Recovery Boilers (WHRBs) for generation of steam. Each WHRB will cater to two Coke Oven batteries. The WHRBs will be of unfired, single drum, top supported natural circulation type. Each boiler will consist of economiser, evaporator and super-heater. The super-heater of the WHRBs will be arranged in two stages with a spray type de-superheater in between to control the steam temperature. Proper arrangements for integral piping and flue gas ducting will also be designed in the WHRBs. The COG after heat recovery in the WHRBs will be released into the atmosphere through two stacks of 70m height. Two of the four WHRBs will be connected to each stack. The technical specifications of the WHRBs are provided below:

| Table-A.4: Technical specifications of WHRBs for COG | | |
|---|---|---|
| Parameter | Unit | Value |
| Steam output maximum continuous rating (MCR) | Tonnes per Hour (TPH) | 24.5 |
| Steam pressure at superheater outlet | $kg/cm^2$ | 67 |
| Steam temperature at superheater outlet | $^0C$ | 490 |
| Feed water temperature at economizer inlet | $^0C$ | 126 |
| COG flow at inlet | $Nm^3/hr$ | 43697 |
| Gas temperature | $^0C$ | 950 |
| Dust Content outlet of ESP | $g/Nm^3$ | N.A |
| Exit Temperature of COG | $^0C$ | 170 |

Stage-II: Generation of power in a steam turbo-generator

The steam generated from the DRI kiln gas WHRBs, BFG boiler and COG based WHRBs will be fed into a common steam header. The power plant will also comprise a Circulating Fluidized Bed Combustion (CFBC) boiler. Steam from the CFBC boiler will also be fed into the common steam header. Thereform the steam will be fed to three similar turbines of 25MW capacity each for generation of power. Three similar single steam turbo-generator sets of impulse-reaction cum straight-condensing type with uncontrolled extraction for regenerative feed heating and de-aerator will be installed for the purpose of generation of power. The technical specifications of the three steam turbo-generator sets are provided herein:

| Table-A.5: Technical specifications of Steam Turbo-Generators | | |
|---|---|---|
| Parameter | Unit | Value |
| Rated capacity of turbine | kW | 24,500 |
| Steam conditions at turbine inlet:<br>Pressure<br>Temperature | <br>$kg/cm^2$<br>$^0C$ | <br>64<br>480 |
| Condenser pressure | $kg/cm^2$ | 0.1 |
| Circulating water temperature at inlet to condenser | $^0C$ | 34 |

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

| Years | Annual estimation of emission reductions in tonnes of $CO_2$ e |
|---|---|
| April 2009 – March 2010 | 341077 |
| April 2010 – March 2011 | 341077 |
| April 2011 – March 2012 | 341077 |
| April 2012 – March 2013 | 341077 |
| April 2013 – March 2014 | 341077 |
| April 2014 – March 2015 | 341077 |
| April 2015 – March 2016 | 341077 |
| April 2016 – March 2017 | 341077 |
| April 2017 – March 2018 | 341077 |
| April 2018 – March 2019 | 341077 |
| **Total estimated reductions** (tonnes of $CO_2$e) | **3410770** |
| **Total number of crediting years** | 10 |
| **Annual average over the crediting period of estimated reductions** (tonnes of $CO_2$e) | **341077** |

### A.4.5. Public funding of the project activity:

No public funding from parties included in Annex-I is available to 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:

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

Reference: Approved consolidated baseline methodology ACM0012/Version 02 Sectoral Scope 1 and 4

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

As per the applicability conditions of the Approved Consolidated Baseline Methodology-ACM0012/Version 02,

*"The consolidated methodology is for project activities that utilize waste gas and/or waste heat as an energy source for:*

- *Cogeneration; or*
- *Generation of electricity; or*
- *Direct use as process heat source; or*
- *For generation of heat in element process (e.g. steam, hot water, hot oil, hot air);*

*The consolidated methodology is also applicable to project activities that use waste pressure to generate electricity."*

The project activity entails recovery of the heat content of the waste gases (*i.e.* the by-product gases which does not have useful applications) generated from DRI kilns, Mini Blast Furnace and Coke Ovens and utilization of the same for generation of steam and subsequently electricity. Therefore the project activity meets the above applicability condition of the methodology.

Apart from the key applicability condition depicted above, the project activity is also required to meet the following applicability condition in order to apply the baseline methodology:

*"If project activity is use of waste pressure to generate electricity, electricity generated using waste gas pressure should be measurable."*- The project activity does not involve usage of the waste gas pressure for generation of electricity. Therefore this applicability condition is not applicable for the project activity under consideration.

*"Energy generated in the project activity may be used within the industrial facility or exported outside the industrial facility*– The electricity generated in the project activity will entirely be used to meet the in-

house power requirement of the integrated iron and steel plant of Visa Steel Limited *i.e.* the entire electrical energy generated in the project activity will be consumed within the industrial facility.

*"The electricity generated in the project activity may be exported to the grid"* – As stated above, the electricity generated in the project activity will entirely be consumed in-house and will not be exported to the grid. Therefore this condition is not applicable for the project activity under consideration.

*"Energy in the project activity can be generated by the owner of the industrial facility producing the waste gas/heat or by a third party (e.g. ESCO) within the industrial facility.*" – Waste gases with substantial heat content will be generated from the DRI kilns, Mini Blast Furnace and Coke Ovens at Visa Steel Limited. Electrical energy will be generated utilising the heat content of the waste gases by the owner of the integrated steel manufacturing facility *i.e.* Visa Steel Limited.

*"Regulations do not constrain the industrial facility generating waste gas from using the fossil fuels being used prior to the implementation of the project activity"*- There is no national or state-level regulation(s) or any legal mandate that would have prevented Visa Steel Limited from using fossil fuels for generation of electrical energy.

*"The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility."*- The project activity is undertaken in the Greenfield integrated iron and steel plant of Visa Steel Limited and the waste gases, used in the project activity, is generated from the DRI kilns, Mini Blast Furnace and the Coke Ovens which are operating in the facility site.

*"The waste gas/pressure utilized in the project activity was flared or released into the atmosphere in the absence of the project activity at existing facility."* – The project activity is undertaken in the Greenfield integrated iron and steel plant of Visa Steel Limited. The waste gases utilized in the project activity does not have any other use in the integrated iron and steel plant of Visa Steel Limited. The same can be demonstrated through on-site verification at the facility site. Therefore the waste gases utilized in the project activity is surplus and would have been flared and/ or cleaned and subsequently released into the atmosphere in absence of the project activity.

*"The credits are claimed by the generator of energy using waste gas/heat/pressure. In case the energy is exported to other facilities an agreement is signed by the owner's of the project energy generation plant*

*(henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by recipient plant(s) for using a zero-emission energy source."*- Visa Steel Limited is implementing the project activity to utilize the heat content of the waste gases generated from their DRI kilns, Mini Blast Furnace and the Coke Ovens for generation of power. The emission reduction credits will solely be claimed by the project proponent *i.e.* Visa Steel Limited. Furthermore the entire power generated by the project activity will be consumed in-house without any export of power. Therefore there will be no other consumer who can claim for any emission reduction credits for using zero-emission electrical energy sources.

"*For those facilities and recipients, included in the project boundary, which prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods:*
*(a) The remaining lifetime of equipments currently being used; and*
*(b) Credit period.*"
– Visa Steel Limited was not involved with power generation before the implementation of the project activity. The project activity has been implemented as a part of the Greenfield integrated iron and steel plant project of Visa Steel Limited. Therefore this condition is not applicable for the project activity under consideration. However all the equipments to be installed under the project activity will have a minimum lifetime of 25 years (please refer to http://www.cercind.gov.in/070104/appendix_2.doc) and the project proponent will claim the emission reduction credits for a fixed crediting period of 10 years.

*"Waste gas/pressure that is released under abnormal operation (emergencies, shut down) of the plant shall not be accounted for."*- The project proponent will not account for any waste gases that will be released under abnormal operation (emergencies shut down) of the plant.

*"Cogeneration of energy is from combined heat and power and not combined cycle mode of electricity generation."*- The project activity does not entail cogeneration of heat and power. Therefore this condition is not applicable for the project activity under consideration.
From the above explanation, it is established that the project activity under consideration meets all the applicability conditions of the Approved Consolidated Baseline Methodology- ACM0012/Version 02. This justifies the appropriateness of the choice of the methodology in view of the above project activity.

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

As per the methodology, the geographical extent of the project boundary shall include:

*"1. The industrial facility where waste gas/heat/pressure is generated (generator of waste energy);*

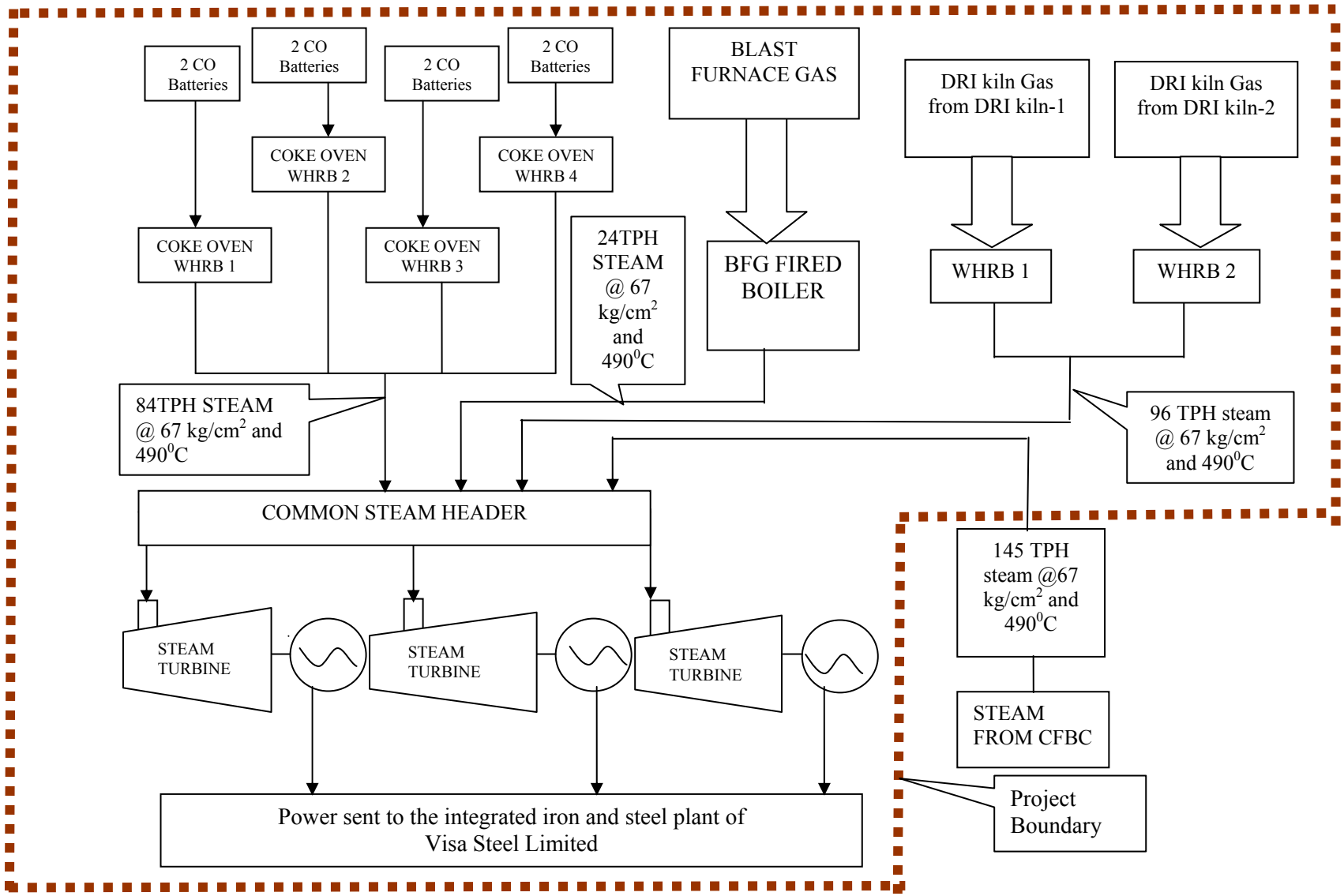
*2. The facility where process heat in element process/steam/electricity are generated (generator of process heat/steam/electricity). Equipment providing auxiliary heat to the waste heat recovery process shall be included within the project boundary; and*

*3. The facility/s where the process heat in element process/steam/electricity is used (the recipient plant(s)) and/or grid where electricity is exported, if applicable."*

In accordance with the guidance of the methodology, the project boundary will include:

1. The source of waste gases *i.e.* the project boundary will extend from the outlet of the After Burning Chambers (ABC) of the DRI kilns, the outlet of the Mini Blast Furnace and the outlet of the Coke Oven batteries of Visa Steel Limited and will include the ducting system for transportation of waste gases from the respective emission sources to the power plant;
2. The power plant equipments where the heat content of the waste gases is utilized for generation steam and subsequently power. This will also include the equipment required to cater to the auxiliary power demand of the power plant; and
3. The integrated iron and steel plant of Visa Steel Limited where the electricity will be consumed.

The following figure provides a diagrammatic representation of the project boundary:


2 CO Batteries
2 CO Batteries
2 CO Batteries
2 CO Batteries
BLAST FURNACE GAS
DRI kiln Gas from DRI kiln-1
DRI kiln Gas from DRI kiln-2
COKE OVEN WHRB 2
COKE OVEN WHRB 4
COKE OVEN WHRB 1
COKE OVEN WHRB 3
24TPH STEAM @ 67 kg/cm2 and 490°C
BFG FIRED BOILER
WHRB 1
WHRB 2
84TPH STEAM @ 67 kg/cm2 and 490°C
96 TPH steam @ 67 kg/cm2 and 490°C
COMMON STEAM HEADER
145 TPH steam @67 kg/cm2 and 490°C
STEAM TURBINE
STEAM TURBINE
STEAM TURBINE
STEAM FROM CFBC
Project Boundary
Power sent to the integrated iron and steel plant of Visa Steel Limited

In accordance with the guidance of the methodology, the following emission sources are considered for the purpose of determination of baseline emissions and project emissions and hence the emission reductions resulting from the project activity:

| Table-B.1: Overview on emission sources included in or excluded from the project boundary | | | | |
|---|---|---|---|---|
| | Source | Gas | Included | Justification/ Explanation |
| Baseline | Electricity generation, grid or captive source | $CO_2$ | Included | Main emission source. |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative. |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative. |
| | Fossil fuel consumption in boiler for thermal energy | $CO_2$ | Excluded | Not applicable since the project activity will not cater to the thermal energy requirement of the integrated iron and steel plant of Visa Steel Limited. |
| | | $CH_4$ | Excluded | |
| | | $N_2O$ | Excluded | |
| | Fossil fuel consumption in cogeneration plant | $CO_2$ | Excluded | Not applicable since the project activity does not entail installation of a cogeneration plant. *(Please refer to Section B.4 of this PDD)*. |
| | | $CH_4$ | Excluded | |
| | | $N_2O$ | Excluded | |
| | Baseline emissions from generation of steam used in the flaring process, if any | $CO_2$ | Excluded | Not applicable since there is no steam requirement in the flaring process of the waste gases. *(Please refer to Section B.4 of this PDD)*. |
| | | $CH_4$ | Excluded | |
| | | $N_2O$ | Excluded | |
| Proposed project activity | Supplementary fossil fuel consumption at the project plant | $CO_2$ | Included | There will be no provision for auxiliary/supplementary fuel firing within the project boundary. However the same will be monitored during the proposed crediting period and emissions from the same will be deducted. |
| | | $CH_4$ | Excluded | Excluded for simplification. |
| | | $N_2O$ | Excluded | Excluded for simplification. |
| | Supplementary electricity consumption | $CO_2$ | Included | Any electricity consumption by power plant equipments in the project scenario will be catered from the power generated with waste gases under normal operating condition. Power consumption under emergency situation by the power plant equipments will anyway be accounted as auxiliary consumption. Therefore there will be no additional unaccounted emission from consumption of supplemental electricity in the project scenario. |
| | | $CH_4$ | Excluded | |
| | | $N_2O$ | Excluded | |
| | Project emissions from cleaning of the gas | $CO_2$ | Excluded | No additional cleaning of waste gases will be required in the project scenario than that in the baseline scenario. Therefore there will not be any additional energy consumption due to cleaning of waste gases in the project scenario. Hence there will not be any additional emissions. |
| | | $CH_4$ | Excluded | |
| | | $N_2O$ | Excluded | |

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

The methodology requires the project proponent to identify all the realistic and credible alternatives available to Visa Steel Limited in absence of the project activity. Realistic and credible alternatives have been identified individually for:

- Utilization of the heat content of the waste gases in absence of the project activity
- Power generation in absence of the project activity

In accordance with the guidance of the methodology, the project proponent has excluded alternatives which

- Do not comply with legal and regulatory requirements; or
- Depend on fuels (used for generation of power) that are not available at the project site

The following section will elaborate on selection of baseline scenario for the project activity under consideration:

*Step1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations*[2]

As per the guidance of the methodology,

"*The baseline candidates should be considered for following facilities:*

- *For the industrial facility where waste gas/heat/pressure is generated; and*
- *For the facility where the energy is produced; and*
- *For the facility where the energy is consumed"*

The project proponent has identified and evaluated all the realistic and credible alternatives for utilisation of the heat content of the waste gases and generation of power. The analysis of all the alternatives has been presented below:

Table-B.2: Potential alternatives for use of waste gases and power generation

[2] The project activity does not entail generation of heat. Therefore realistic and credible alternatives for generation of heat energy in absence of the project activity have not been considered.

| Option | Description | Credibility | Conclusion |
|---|---|---|---|
| Utilization of the heat content of the waste gases | | | |
| W1 | Waste gas is directly vented to atmosphere without incineration | As per the legal requirement, the waste gases are required to be combusted completely before the same can be discharged into the atmosphere[3]. Therefore direct venting of waste gases to the atmosphere without incineration is not a feasible option for the project proponent in absence of the project activity. | Cannot be a part of the baseline |
| W2 | Waste gas is released to the atmosphere after incineration | In absence of the project activity, the project proponent could have flared (*i.e.* releasing after complete combustion) the waste gases into the atmosphere. In such a situation, the entire heat energy content of the waste gases would have been lost. This alternative is in compliance with all the legal and regulatory requirements and can be a part of the baseline. Therefore this alternative is considered further for determination of baseline scenario for the project activity under consideration. | May be a part of the baseline |
| W3 | Waste gas is sold as an energy source | This alternative can not be considered as a realistic and credible alternative for the project proponent in absence of the project activity. There is no potential purchaser for the waste gases in the vicinity. Furthermore transportation of the waste gases over a long distance is hazardous considering its composition and is not techno-economically feasible. | Cannot be a part of the baseline |
| W4 | Waste gas is used for meeting energy demand | In absence of the project activity, the heat content of the waste gases could have been utilized for generation of energy. However this alternative would have faced all the investment related risks and barriers that the project activity is facing *(please refer to Section B.5 of the Project Design Document for details)*. Therefore in absence of CDM revenue, this alternative can not be considered as a realistic and credible alternative for the project proponent. | Cannot be a part of the baseline |

| Table-B.2: Potential alternatives for use of waste gases and power generation | | | |
|---|---|---|---|
| Option | Description | Credibility | Conclusion |

[3] DRI kiln waste gas will be combusted within the After Burning Chamber (ABC) and Coke Oven Gas will be combusted within the non-recovery type coke ovens before their release into the atmosphere. The Blast Furnace Gas will be flared before its discharge into the atmosphere.

| Table-B.2: Potential alternatives for use of waste gases and power generation | | | |
|---|---|---|---|
| Option | Description | Credibility | Conclusion |
| Power Generation | | | |
| P1 | Proposed project activity not undertaken as a CDM project activity | In absence of the project activity, the project proponent could have utilized the heat content of the waste gases for generation of power. However this alternative would have faced all the investment related risks and barriers that the project activity is facing *(please refer to Section B.5 of the Project Design Document for details)*. Therefore in absence of CDM revenue, this alternative can not be considered as a realistic and credible alternative for the project proponent. | Cannot be a part of the baseline |
| P2 | On site or off site existing/new fossil fuel powered cogeneration plant | The project proponent does not have any requirement for steam. Therefore installation of a fossil fuel fired cogeneration plant in absence of the project activity is not a realistic and credible alternative for the project proponent. | Cannot be a part of the baseline |
| P3 | On site or off site existing/new renewable energy based cogeneration plant | The project proponent does not have any requirement for steam. Therefore installation of a renewable energy based cogeneration plant in absence of the project activity is not a realistic and credible alternative for the project proponent. Furthermore, renewable energy based energy generation system is not a prevailing practice in the eastern region of the country where the project activity plant is situated because of limited availability of renewable resources. | Cannot be a part of the baseline |
| P4 | On site or off site existing/ new fossil fuel based existing captive or identified plant | In absence of the project activity, the project proponent could have installed a fossil fuel fired captive power plant for generation of electrical energy equivalent to that generated in the project activity.<br>This alternative is in compliance with all the legal and regulatory requirements and can be a part of the baseline. Therefore this alternative is considered further for determination of baseline scenario for the project activity under consideration. | May be a part of the baseline |
| P5 | On site or off site existing/new renewable energy based existing captive or identified plant | This alternative is not a realistic and credible alternative for the project proponent in absence of the project activity considering limited availability of renewable resources in the eastern region of the country where the project activity plant is situated. | Cannot be a part of the baseline |

| Table-B.2: Potential alternatives for use of waste gases and power generation | | | |
|---|---|---|---|
| Option | Description | Credibility | Conclusion |
| P6 | Source Grid connected power plants | In absence of the project activity, the project proponent could have chosen not to generate any power. Under such a situation, electrical energy equivalent to that generated in the project activity would have been generated at power plants connected to the grid where the project activity power plant is connected.<br>This alternative is in compliance with all the legal and regulatory requirements and can be a part of the baseline. Therefore this alternative is considered further for determination of baseline scenario for the project activity under consideration. | May be a part of the baseline |
| P7 | Captive electricity generation from waste gas (if project activity is captive generation with waste gas, this scenario represents captive generation with lower efficiency than the project activity) | As discussed above, utilization of the heat content of the waste gases for power generation is not a realistic and credible alternative for the project proponent considering the investment related risks and barriers associated with the project activity *(please refer to Section B.5 of the Project Design Document for details)*. In absence of the project activity, the waste gases would have been flared without utilizing it for generation of electrical energy. Therefore the project activity does not entail any efficiency improvement in power generation from that in the baseline scenario and this alternative is not a realistic and credible alternative for the project proponent. | Cannot be a part of the baseline |
| P8 | Cogeneration from waste gas (if project activity is cogeneration with waste gas, this scenario represents cogeneration with lower efficiency than the project activity) | The project activity is not a cogeneration activity. Therefore this alternative is not a realistic and credible alternative for the project proponent. | Cannot be a part of the baseline |

From the above evaluation, it can be concluded that in absence of the project activity, the project proponent could have opted for the following two alternatives:

| Table-B.3: Potential alternatives available to Visa Steel Limited in absence of the project activity | | | |
|---|---|---|---|
| Alternative | Baseline Alternatives | | Description of Alternative |
| | Waste Gas | Power | |
| 1 | W2 | P4 | With this alternative in place, the waste gases generated from the DRI kilns, Mini Blast Furnace and the Coke Ovens of Visa Steel Limited would have been flared and the heat energy content of the waste gases would have been wasted. Power, equivalent to that generated in the project activity, would have been generated in a fossil fuel fired captive power plant.<br>As stated above, this alternative is in compliance with all the legal and regulatory requirements and can be a part of the baseline. Therefore this alternative is considered further for determination of baseline scenario for the project activity under consideration. |
| 2 | W2 | P6 | With this alternative in place, the waste gases generated from the DRI kilns, Mini Blast Furnace and the Coke Ovens of Visa Steel Limited would have been flared and the heat energy content of the waste gases would have been wasted. Power, equivalent to that generated in the project activity, would have been generated at power plants connected to the grid where the project activity power plant is connected.<br>As stated above, this alternative is in compliance with all the legal and regulatory requirements and can be a part of the baseline. Therefore this alternative is considered further for determination of baseline scenario for the project activity under consideration. |

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

Amongst the two alternatives identified above, Alternative-1 entails generation of power in a fossil fired captive power plant. With this alternative in place, the project proponent would have set up a fossil fuel fired captive power plant. Coal is considered as the most plausible fossil fuel option since it is available in abundance in the eastern region of the country where the project activity plant is situated. Furthermore the other options like,

- diesel based electricity generation is highly expensive and is primarily used for emergency purposes; and

- natural gas based electricity generation is not a feasible option for the project proponent considering the locational disadvantages *i.e.* non-availability of natural gas in the eastern region of the country where the project activity plant is situated

Therefore in case of Alternative-1, the project proponent would have set up a coal based captive power plant to generate electrical energy equivalent to that generated in the project activity.

Alternative-2 entails generation of power at power plants connected to the grid where the project activity power plant is connected. Grid power consists of power generated with different fuels like fossil fuels

(*e.g.* coal, diesel, natural gas *etc.*), renewable resources (*e.g.* hydro, wind, biomass *etc.*), nuclear power *etc* .The availability of the fuels at the respective power plants connected to the grid will always be ensured by the respective power producers for their own sustenance.

*Step 3: Step 2 and/or step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality (Version 05.2)",shall be used to identify the most plausible baseline scenarios by eliminating non-feasible options*

In accordance with the guidance of the methodology, Visa Steel Limited has carried out a complete economical analysis amongst the realistic and credible alternatives (as mentioned above) as given below:

Table-B.4: Economic analysis of all the realistic and credible alternatives available with Visa Steel Limited in absence of the project activity[4]

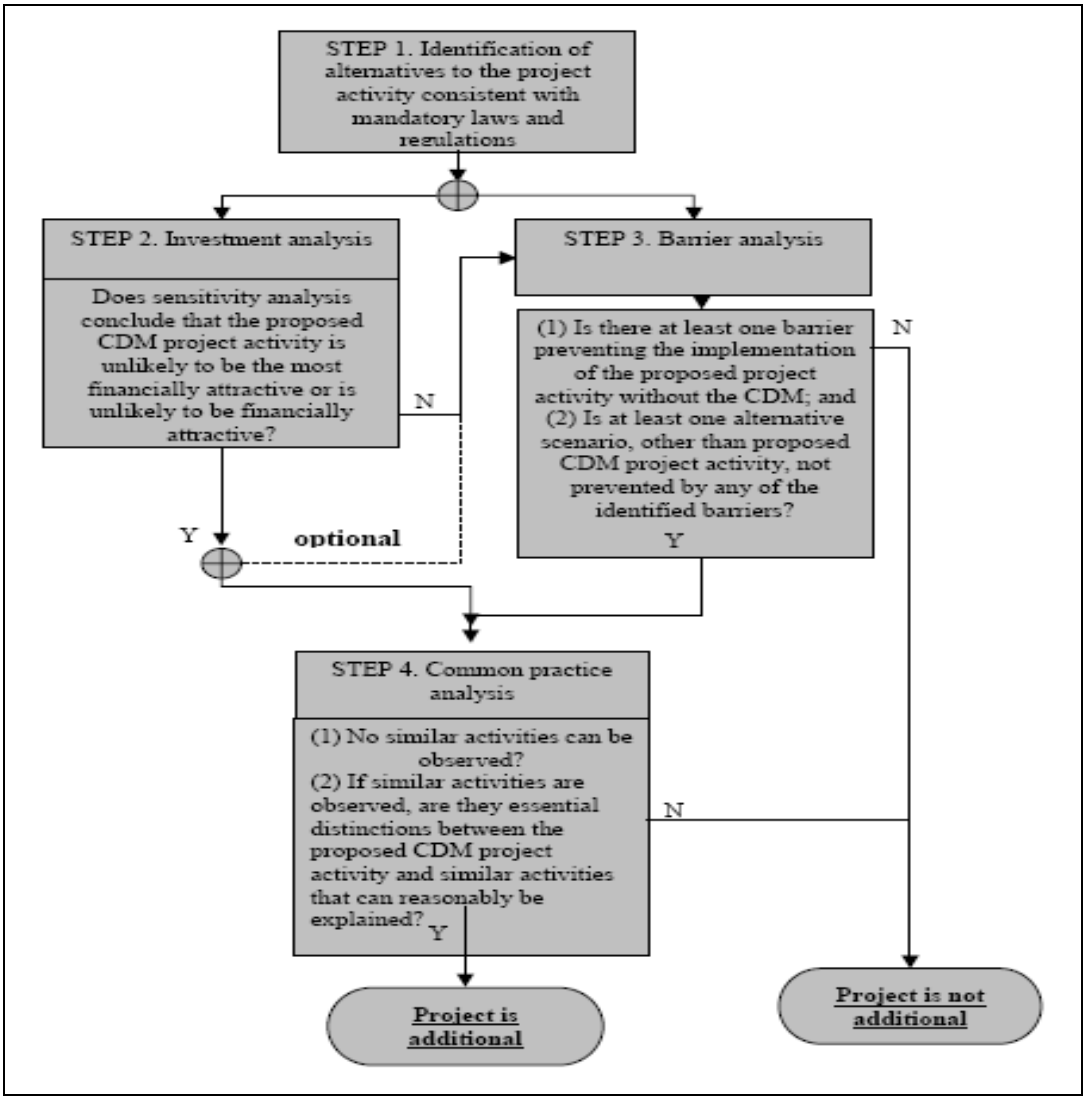
| Parameters | Alternative-1: Generation of power in a coal based captive power plant | Alternative 2. Import of power from the grid |
|---|---|---|
| Generation Cost (INR/kWh) | 2.09 | 3.20 |
| Comments on financial aspects | 1. Higher capital investment (*i.e.* fixed cost is higher), hence some financial assistance will be required from banks/ financial institutions.<br>2. The generation cost (*i.e.* operating cost) is low. | 1. No capital investment (*i.e.* fixed cost is nil) required. Electricity could be procured immediately.<br>2. The power purchase cost (*i.e.* operating cost) is very high. |
| Conclusion | Considering all the points mentioned above, 'Alternative-1: Generation of power in a coal based captive power plant' is found to be the most economically attractive option available to Visa Steel Limited in absence of the project activity and therefore, as per the methodology, this alternative option is 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):**

As per the decision 17/cp.7 para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in absence of the

registered CDM project activity. The methodology requires the project proponent to determine its additionality based on the "Tool for the demonstration and assessment of additionality (Version 05.2)", agreed by the CDM Executive Board.

The flowchart presented in below provides a step-by-step approach to establishing additionality of the project activity:




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

In Sub-step 1a (Define alternatives to the project activity) and Sub-step 1b (Consistency with mandatory laws and regulations), Visa Steel Limited is required to identify the realistic and credible alternative(s)

[4] Please refer to Section B.5 of the Project Design Document for details on power generation cost for Alternative-1

that will provide output or services comparable with the project activity. These alternatives are required to be in compliance with all applicable legal and regulatory requirements.

The identification of alternatives for waste gases utilisation and power generation as well as their compliance with the current laws and regulations have been dealt in details in Section B.4 of the Project Design Document. Both the alternatives (*i.e.* 'Alternative-1: Generation of power in a coal based captive power plant' and 'Alternative-2: Import of power from the grid') as well as the project option (*i.e.* Recovery and utilisation of the heat content of the waste gases for power generation) are in line with the current laws and regulations those are enforced in the host country-India. Therefore Visa Steel Limited could have implemented either of the two alternatives (*i.e.* Alternative-1 or Alternative-2) or the project activity. However implementation of either Alternative-2 or the project activity without CDM revenue is not a feasible alternative for the project proponent. The same has been illustrated below through 'Step 2: Investment Analysis'.

Step 2. Investment analysis

As per the investment analysis, the project proponent is required to determine whether the project activity is economically or financially less attractive than other alternatives without the revenue from the sale of Certified Emission Reductions (CERs). To conduct the investment analysis, Visa Steel Limited is required to use the following sub-steps:

*Sub-step 2a. Determine appropriate analysis method*

The project activity will generate electricity for in-house consumption and has financial implications other than those related to CDM. Therefore 'Option-I: Simple cost analysis' would not be an appropriate analysis method.

Amongst the other two options *i.e.* 'Option-II: Investment comparison analysis' and 'Option-III: Benchmark analysis', Visa Steel Limited has adopted the investment comparison analysis wherein the financial indicator(s) of the project activity (*i.e.* Recovery and utilisation of the heat content of the waste gases for power generation) is compared with other alternatives (*i.e.* 'Alternative-1: Generation of power in a coal based captive power plant' and 'Alternative-2: Import of power from the grid'). If at least one of the alternatives has a better indicator (*e.g.* higher project IRR / lower unit cost of service), then the project activity can not be considered as the most financially attractive option.

*Sub-step 2b. Option II. Apply investment comparison analysis*

Visa Steel Limited conducted an investment analysis for both the alternatives (*i.e.* Alternative-1 or Alternative-2) that were available with them in absence of the project activity and the project activity

and Alternative-2.

without CDM benefit. The unit power cost has been used as the financial indicator for the investment comparison analysis. The unit power cost is calculated taking into consideration both fixed and variable cost. All relevant assumptions used for the investment analysis have been provided below and the financial computations on the unit power cost for the alternatives have been provided to the DOE.

*Sub-step 2c. Calculation and comparison of financial indicators*

Unit power cost for 'Alternative-1: Generation of power in a coal based captive power plant'

The unit power cost in case of Alternative-1 is computed based on the following assumptions:

| Unit Power Cost for 'Alternative-1: Generation of power in a coal based captive power plant' | | |
|---|---|---|
| Description | Units | CFBC |
| | | |
| Power Generation Capacity | MW | 115 |
| Auxiliary Consumption | % | 10 |
| Annual Operational Days | Days/annum | 350 |
| Gross Electricity Generated | MWh/annum | 965806 |
| Net Electricity Generated | MWh/annum | 869225 |
| | | |
| **Variable Cost** | | |
| **Determination of Fuel Cost** | | |
| Station Heat Rate | kCal/kWh | 2867 |
| Thermal Energy Input | kCal/annum | 2.76864E+12 |
| Quantity of Coal Fines consumed | MT/annum | 36000 |
| Gross Calorific Value of Coal Fines | kCal/kg | 3600 |
| Quanity of Coal Char consumed | MT/annum | 75000 |
| Gross Calorific Value of Coal Char | kCal/kg | 2000 |
| Quanity of Coal consumed | MT/annum | 777826 |
| Gross Calorific Value of Coal | kCal/kg | 3200 |
| Coal Fines Cost | Rs./MT | 800 |
| Coal Char Cost | Rs./MT | 0 |
| Coal Cost | Rs./MT | 1150 |
| **Total fuel cost for power generation** | **Rs./kWh** | **1.06** |
| | | |
| **Total Utility Cost-Water & Chemicals** | **Rs./kWh** | **0.05** |
| | | |
| **Total Variable Cost for power generation** | **Rs./kWh** | **1.11** |
| | | |
| **Fixed Cost** | | |
| **Capital Investment** | | |
| Total Project Cost | Rs. Lacs | 45991 |
| Equity Portion | Rs. Lacs | 13797 |
| Loan Portion | Rs. Lacs | 32194 |
| Interest on Loan | Rs. Lacs/annum | 3380 |
| Retun on Equity | Rs. Lacs/annum | 1656 |
| **Total Interest** | **Rs./kWh** | **0.58** |
| | | |
| **Depreciation** | | |
| Depreciation on Building Cost | Rs. Lacs/annum | 230 |
| Depreciation on Plant & Macineries | Rs. Lacs/annum | 2064 |
| **Total Depreciation** | **Rs./kWh** | **0.26** |
| | | |
| **Operation & Maintenance** | | |
| Operation & Maintenance | Rs. Lacs/annum | 1150 |
| **O&M Expenses** | **Rs./kWh** | **0.13** |
| | | |
| | | |
| **Total Fixed Cost for power generation** | **Rs./kWh** | **0.98** |
| | | |
| **Unit Cost of Power Generation** | **Rs./kWh** | **2.09** |

Unit power cost for 'Alternative-2: Import of power from the grid'

The unit power cost in case of Alternative-2 is computed based on the following assumptions:

| Unit Power Cost for 'Alternative-2: Import of power from the grid' | | |
|---|---|---|
| **Description** | **Units** | **Grid Power** |
| | | |
| Capital Investment | Rs. Lacs | NIL |
| Power Purchase Cost | Rs./kWh | 3.20 |
| | | |
| **Unit Cost of Power Generation** | **Rs./kWh** | **3.20** |

Unit power cost in the project scenario[5]

The unit power cost in case of project activity is computed based on the following assumptions:

| Unit Power Cost in Project Scenario | | | | |
|---|---|---|---|---|
| Description | Units | CFBC | Waste Gas | Grid |
| | | | | |
| Power Generation Capacity | MW | 31.1 | | |
| Gross Electricity Generated | MWh/annum | 261000 | | |
| Net Electricity Generated | MWh/annum | 234900 | 295766 | 338559 |
| | | | | |
| **Variable Cost** | | | | |
| **Determination of Fuel Cost** | | | | |
| Station Heat Rate | kCal/kWh | 2867 | | |
| Thermal Energy Input (Coal-Char mix) | kCal/annum | 7.482E+11 | | |
| Quantity of Coal Fines consumed | MT/annum | 36000 | | |
| Gross Calorific Value of Coal Fines | kCal/kg | 3600 | | |
| Quanity of Coal Char consumed | MT/annum | 75000 | | |
| Gross Calorific Value of Coal Char | kCal/kg | 2000 | | |
| Quanity of Coal consumed | MT/annum | 146438 | | |
| Gross Calorific Value of Coal | kCal/kg | 3200 | | |
| Coal Fines Cost | Rs./MT | 800 | | |
| Coal Char Cost | Rs./MT | 0 | | |
| Coal Cost | Rs./MT | 1150 | | |
| **Total fuel cost for power generation** | **Rs./kWh** | **0.84** | **0.00** | **0.00** |
| | | | | |
| **Total Utility Cost-Water & Chemicals** | **Rs./kWh** | **0.05** | **0.05** | **0.00** |
| | | | | |
| **Total Variable Cost for power generation** | **Rs./kWh** | **0.89** | **0.05** | **0.00** |
| | | | | |
| **Fixed Cost** | | | | |
| **Capital Investment** | | | | |
| Total Project Cost | Rs. Lacs | 12429 | 23571 | |
| Equity Portion | Rs. Lacs | 3729 | 7071 | |
| Loan Portion | Rs. Lacs | 8700 | 16500 | |
| Interest on Loan | Rs. Lacs/annum | 914 | 1733 | |
| Retun on Equity | Rs. Lacs/annum | 447 | 849 | |
| **Total Interest** | **Rs./kWh** | **0.58** | **0.87** | |
| | | | | |
| **Depreciation** | | | | |
| Depreciation on Building Cost | Rs. Lacs/annum | 62 | 118 | |
| Depreciation on Plant & Macineries | Rs. Lacs/annum | 558 | 1058 | |
| **Total Depreciation** | **Rs./kWh** | **0.26** | **0.40** | |
| | | | | |
| **Operation & Maintenance** | | | | |
| Operation & Maintenance | Rs. Lacs/annum | 311 | 589 | |
| **O&M Expenses** | **Rs./kWh** | **0.13** | **0.20** | |
| | | | | |
| **Total Fixed Cost for power generation** | **Rs./kWh** | **0.98** | **1.47** | **3.20** |
| | | | | |
| **Total Cost of Power Generation** | **Rs./kWh** | **1.87** | **1.52** | **3.20** |
| | | | | |
| **Unit Cost of Power Generation** | **Rs./kWh** | **2.27** | | |

[5] The electricity generation with waste gases in the project scenario consists of generation of 133303 MWh of net electrical energy per annum with DRI kiln waste gas, 36103 MWh of net electrical energy per annum with BFG and 126360 MWh of net electrical energy per annum with COG.

As per the above investment comparison analysis of the financial indicator for the project activity and the project alternatives, it is found that 'Alternative-1: Generation of power in a coal based captive power plant' has the best financial indicator (*i.e.* it has the lowest unit power cost) amongst all plausible alternatives including the project activity without CDM revenue. As per the "Tool for the demonstration and assessment of additionality (Version 05.2)", *"If one of the other alternatives has the best indicator (e.g. highest IRR), then the CDM project activity can not be considered as the most financially attractive"*. It may therefore be concluded that the project activity can not be considered as the most financially attractive proposition.

*Sub step 2d. Sensitivity analysis*

The value of the unit power cost is found to be sensitive to the following parameters:

- Coal price
- Grid power purchase cost
- Net power generated with waste gases

The sensitivity analysis has been conducted for scenarios with variations in each one of the above-mentioned key factors and for scenarios with variations in different combinations of the above-mentioned key factors simultaneously in order

- ✓ to assess whether the conclusion regarding the financial attractiveness (of Alternative-1) is robust to reasonable variations in the critical assumptions.
- ✓ to assess whether the conclusion that the project activity is unlikely to be the most financially attractive is robust to reasonable variations in the critical assumptions

Table-B.5: Sensitivity Analysis

| Sl. No. | Parameters | Variation | Unit Power Cost (Rs./kWh) | | Comment |
|---|---|---|---|---|---|
| | | | Base Case | Project Activity | |
| 1. | Coal price | +10% | 2.19 | 2.29[6] | In both the situations, the unit power cost in the project scenario is higher than that for Alternative-1. |
| | | -10% | 1.98 | 2.25 | |
| 2. | Grid power purchase cost | +10% | 2.09 | 2.39 | In both the situations, the unit power cost in the project scenario is higher than that for Alternative-1. |
| | | -10% | 2.09 | 2.14 | |
| 3. | Net power generated with waste gases | +5% | 2.09 | 2.21 | In both the situations, the unit power cost in the project scenario is higher than that for Alternative-1. |
| | | -5% | 2.09 | 2.32 | |
| 4. | Combination of parameters 1 and 2 | 1→ +10%<br>2→ +10% | 2.19 | 2.41 | In both the situations, the unit power cost in the project scenario is higher than that for Alternative-1. |
| | | 1→ -10%<br>2→ -10% | 1.98 | 2.12 | |
| 5. | Combination of parameters 1 and 3 | 1→ +10%<br>3→ +5% | 2.19 | 2.23 | In both the situations, the unit power cost in the project scenario is higher than that for Alternative-1. |
| | | 1→ -10%<br>3→ -5% | 1.98 | 2.30 | |
| 6. | Combination of parameters 2 and 3 | 2→ +10%<br>3→ -5% | 2.09 | 2.45 | In both the situations, the unit power cost in the project scenario is higher than that for Alternative-1 (the power cost in the second situation is slightly higher in project scenario than that in case of Alternative-1). |
| | | 2→ -10%<br>3→ +5% | 2.09 | 2.09 | |
| 7. | Combination of parameters 1, 2 and 3 | 1→ +10%<br>2→ +10%<br>3→ -5% | 2.19 | 2.47 | In all the situations, the unit power cost in the project scenario is higher than that for Alternative-1. |
| | | 1→ -10%<br>2→ -10%<br>3→ +5% | 1.98 | 2.08 | |
| | | 1→ +10%<br>2→ +10%<br>3→ +5% | 2.19 | 2.35 | |
| | | 1→ -10%<br>2→ -10%<br>3→ -5% | 1.98 | 2.17 | |

The results of the sensitivity analysis conducted substantiate that the unit power cost in case of Alternative-1 is lower and therefore Alternative-1 is financially more attractive than the project activity.

Hence, it may be concluded that

(a) 'the project activity without CDM revenue is not the most financially attractive option' is robust to reasonable variations in the critical assumptions and that

(b) the CDM revenue the project activity would obtain through sale of the emission reductions has been one of the most important determinants for Visa Steel Limited to opt for the project activity which is financially less attractive than Alternative-1.

The major milestones in the CDM project activity of Visa Steel Limited has been tabulated below.

[6] The unit power cost would possibly increase also due to the increased cost of the component from grid's power

| Chronology of Events for "GHG emission reductions through waste gas based power generation at Visa Steel Limited" | | | |
|---|---|---|---|
| Milestone | Date | Supportive Document | Comment |
| Project approval by the Management of M/s. Visa Steel Limited | 25-Jun-05 | Extracts of the Minutes of the Forty Third Meeting of the Board of Directors, Visa Steel Limited | |
| Interactions with CDM Consultants | July-November 2005 | Communications with CDM Consultants | |
| Placement of Work Order to CDM Consultant | 3-Nov-05 | Work Order | Selection of CDM Consultant based on their expertise for development of similar methodologies. The appointed CDM Consultant has developed a methodology "NM0031: OSIL-10MW Waste Heat Recovery Based Captive Power Project"-Similar to the project activity under consideration. |
| Submission of new methodology in Round-15 by the appointed CDM Consultant in the name "NM0179: Waste Heat Recovery based Steam and Power Generation" | May-06 | http://cdm.unfccc.int/methodologies/PAmethodologies/publicview.html?single=1&OpenNM=NM0179 | As the methodology NM0031 (which was approved as ACM0004) was not applicable for projects where electricity is generated with both waste gas and fossil fuels (similar to the project activity under consideration). Furthermore AM_REV_0033 could not be followed as the same is applicable only when steam generated with waste gas and fossil fuel are fed to a single turbine whereas the project activity comprises of three turbines. |
| Requesting quotations from Validators | 13-Mar-07 | Communications to the Validators | |
| Approval of NM0179 as ACM0012/ Version 01 | 6-Jul-07 | http://cdm.unfccc.int/methodologies/DB/3YL5T8ATMB8NTD9HEBU42EP6OJLAY4/view.html | |
| Preparation of PDD and PCN in accordance with ACM0012/ Version 01 | July-October 2007 | | |
| Requesting revised quotations from Validators | 27-Sep-07 | Communications to the Validators | |
| Submission of PDD to Ministry of Environment & Forests (MoEF), Government of India | 23-Oct-07 | Forwarding Letter to MoEF, GOI | |
| Appointment of Validator | 3-Dec-07 | Contract with M/s. SGS | As M/s.SGS has already faced similar problem in their project validation related to waste gas metering |
| Presentation at Ministry of Environment & Forests (MoEF), Government of India | 8-Jan-08 | Host Country Approval Letter (Ref. No.-4/24/2007-CCC) | |
| Receipt of Host Country Approval Letter | 23-Jan-08 | | |
| Discussion with Validators on waste gas measurement (as required by ACM0012/ Version 02) | Until April 2008 | | M/s. SGS has sought for a Clarification to Meth Panel of UNFCCC on waste gas measurement on 18 January 2008 (Reference: http://cdm.unfccc.int/UserManagement/FileStorage/WVN062D42DP04OWKMZ5PH1Q10FOMZV) |
| Clarification provided by Meth Panel against the Clarification raised by M/s. SGS on waste gas measurement | 7-11 April 2008 | AM_CLA_0077 (http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_GU59XMVIK6RS6RXDL25B0HBHWHAP30) | |
| Revision of PDD in accordance with ACM0012/ Version 02 and AM_CLA_0077 | Jun-08 | | |
| Review of PDD by M/s. Visa Steel Limited and finalisation of PDD for submission to Validator | Jul-08 | | After detailed assessment of all the aspects of monitoring |
| Publication of PDD for Global Stakeholder Consultation | 7 August 2008-5 September 2008 | | |

purchase, however it is not possible to predict the increase.

Step 4. Common practice analysis

The project proponent is further required to conduct the common practice analysis as a credibility check to complement the investment analysis (Step 2). The project proponent is required to identify and discuss the existing common practice through the following sub-steps:

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

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

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

The Indian integrated iron and steel industry consists of the following plants besides Visa Steel Limited:

1. Five plants of Steel Authority of India Limited (SAIL) namely
   - Bhilai Steel Plant (BSP)
   - Durgapur Steel Plant (DSP)
   - Rourkela Steel Plant (RSP)
   - Bokaro Steel Plant (BSL) and
   - IISCO Steel Plant (ISP)
2. Rashtriya Ispat Nigam Limited (RINL)
3. Ispat Industries
4. JSW Steel Limited
5. Jindal Steel & Power Limited
6. Essar Steel
7. Adhunik Metaliks Limited
8. Tata Steel Limited

In all the SAIL plants, non-coking coal is used for power generation[7]. The only LD Gas recovery based power generation project at Rourkela Steel Plat[8] is developed under CDM and the same is registered with UNFCCC. The power requirement at Rastriya Ispat Nigam Limited[9] and Ispat Industries[10] is also met with coal as the fuel source. The power requirement of JSW Steel Limited and Jindal Steel & Power Limited is met respectively from a 'Blast Furnace Gas and Corex Gas based power generation system' and 'Coke Oven Gas based power generation system'. Both these power generation projects have been

[7] Source : http://www.sail.co.in/aboutus.php?tag=company-energy

[8] Source : http://cdm.unfccc.int/UserManagement/FileStorage/D0YOKH0N9YHKRWDMSX7I67L0UA9XXW

[9]Source : http://www.energymanagertraining.com/eca2004/awardbooklet2004/176-181CHAPTER23%20(VISAKHAPATNAM).pdf

developed with CDM revenue into consideration and are registered with UNFCCC[11]. Essar Steel is in the process of setting up a natural gas based power generation facility to meet their power demand[12]. Both Adhunik Metaliks Limited[13] and Tata Steel Limited[14] have waste heat recovery based power plants and these projects are under an advanced stage of validation in the CDM cycle. The waste heat recovery based power plant at Adhunik Metaliks Limited is based on the waste gas of the DRI kiln. The waste heat based recovery power plants in Tata Steel Limited are based on waste gases from Blast Furnace, Coke Oven and Basic Oxygen Furnace.

Therefore it can be concluded that the project activity of waste gases based power generation system to cater to the power requirement has not been adopted widely by the Indian integrated iron and steel plants. Only three waste gas based power generation system have so far been implemented in the relevant industrial sector and all three of them have been conceived with CDM revenue into consideration. The common practice scenario therefore demonstrates that there is a poor penetration of this technology in the Indian integrated iron and steel sector which can be attributed to the various investment risks associated with the project activity implementation.

From the above discussion, it can be established that the project activity is not a feasible option for the project proponent considering all the financial risks associated with its implementation. The Management of Visa Steel Limited has been appraised about all these direct financial risks which even have the potential to make the project proposal completely unviable. Furthermore the failure of the project activity could ultimately lead to a production downtime and subsequently into loss of revenue. However the Management of Visa Steel Limited could realize the potential of the CDM revenue that can be made available once the project activity is commissioned and registered with UNFCCC. With immense confidence on Kyoto Protocol-Clean Development Mechanism, the Management of Visa Steel Limited has finally decided to implement the project activity as a climate change initiative.

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[10] Source : http://www.rediff.com/money/2003/may/29ispat.htm

[11] Source : http://cdm.unfccc.int/UserManagement/FileStorage/5K5XJ3GMSTGYQE2KT3IL1NP0RGLSVK and http://cdm.unfccc.int/UserManagement/FileStorage/XQKW19L92IAYD0XP1QP8YRQIU3ZL8I

[12] Source: http://www.projectsmonitor.com/detailnews.asp?newsid=10794

[13] http://cdm.unfccc.int/UserManagement/FileStorage/IYZ32UCOLFQMW7K5DS8RVXJP46EG91

[14] http://cdm.unfccc.int/Projects/Validation/DB/WKQW26A1B9K7I4Q7F449JLVQI5P707/view.html

http://cdm.unfccc.int/Projects/Validation/DB/ZJPUUUHM7IA8AF8P2PWM24OQGWGSC8/view.html

## B.6. Emission reductions:

### B.6.1. Explanation of methodological choices:

As per the selection of the baseline scenario conducted in Section B.4 of this PDD, 'Alternative-1: Generation of power in a coal based captive power plant' is found to be the baseline scenario. Therefore following the guidance of the methodology, the baseline emissions will be computed by quantifying the emissions related to flaring of waste gases (if any) and the emissions related to generation of power (equivalent to the net power generated in the project activity) at the coal based captive power plant. Project emissions are applicable only if auxiliary fuels are fired for supplementing the heat content of the waste gases and in case of electrical energy consumption for waste gases cleaning prior to its utilization for power generation. The methodology does not require the project proponent to consider any leakage emissions. Therefore the emission reduction resulting from the project activity will be computed as a difference between the baseline emissions and the project emissions.

Computation of Baseline Emissions

As per the baseline scenario (*i.e.* Alternative-1), power, equivalent to the net power generated in the project activity, would have been generated in a coal based captive power plant. Therefore following the guidance of the methodology, the baseline emission will be computed as:

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

Where:

$BE_y$ = Baseline emissions during the year y (in tonnes of $CO_2$)

$BE_{En,y}$ = Baseline emissions from electrical energy generated by project activity during the year y (in tonnes of $CO_2$)

$BE_{flst,y}$ = Baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (in tonnes of $CO_2$).

'y' is any year within the proposed crediting period of the project activity.

However, as stated above in Section B.3 of the PDD, there would not be any steam requirement in order to flare the waste gases generated from the DRI kilns, Mini Blast Furnace and the Coke Ovens at Visa Steel Limited in absence of the project activity *i.e.,*

$$BE_{flst,y} = 0$$

Therefore the baseline emissions resulting from the project activity can be considered as:

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

In accordance with the guidance provided in the methodology *(please refer to 'Baseline emissions for Scenario 1')*, the baseline emissions from electrical energy generated by the project activity will be computed as:

$$BE_{En,y} = BE_{Elec,y} = f_{cap} \times f_{wg} \times \sum_{j} \sum_{i} \left( EG_{i,j,y} \times EF_{Elec,i,j,y} \right)$$

Where:

$BE_{En,y}$ = Baseline emissions from electrical energy generated by project activity during the year y (in tonnes of $CO_2$)

$BE_{Elec,y}$ = Baseline emissions from electricity during the year y (in tonnes of $CO_2$)

$EG_{i,j,y}$ = Quantity of electricity supplied to the recipient *j* by generator which in the absence of the project activity would have been sourced from the $i^{th}$ source (*i.e.* the coal based captive power plant) during the year y (in MWh)

$EF_{elec,i,j,y}$ = $CO_2$ emission for the electricity source *i* (*i.e.* the coal based captive power plant), displaced due to the project activity during the year y (in tonnes $CO_2$/MWh)

$f_{WG}$ = Fraction of total electricity generated by the project activity using waste gases, calculated as given below

$f_{cap}$ = Energy that would have been produced in project year y using waste gases generated in base year expressed as a fraction of total energy produced using waste gases in year y, determined as given below

'y' is any year within the proposed crediting period of the project activity.

Determination of $f_{wg}$

For the project activity under consideration,

- Steam generated with DRI kiln gas, Blast Furnace Gas (BFG) and Coke Oven Gas (COG) and
- Steam generated from the Circulating Fluidized Bed Combustion Boiler

will be fed to a common steam header and therefrom to the steam turbo-generator sets for generation of power. Therefore $f_{WG}$ will be determined following the guidance of the methodology *(please refer to Situation 2 of "Calculation of the energy generated in units supplied by waste gas/heat and other fuels")* as given below:

$$f_{wg} = \frac{ST_{whr,y}}{ST_{whr,y} + ST_{other,y}}$$

Where:

$f_{WG}$ = Fraction of total electricity generated by the project activity using waste gases

$ST_{whr,y}$ = Energy content of the steam generated in Waste Heat Recovery Boilers of DRI kiln gas and

Coke Oven Gas and BFG Boiler and fed to turbine via common steam header (in kCal)

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

'y' is any year within the proposed crediting period of the project activity.

Determination of $f_{cap}$

In accordance with the guidance of the methodology *(please refer to Method 2 of "Capping of baseline emissions")*, the baseline emissions will be capped at the maximum quantity of waste gases that would have been generated before the implementation of the project activity. With this consideration, $f_{cap}$ will be determined as given below:

$$f_{cap} = \frac{Q_{WG,BL}}{Q_{WG,y}}$$

Where:

$Q_{WG,BL}$ = Quantity of waste gases generated prior to the start of the project activity calculated as given below ($Nm^3$)

$Q_{WG,y}$ = Quantity of waste gases used for energy generation during year y ($Nm^3$)

'y' is any year within the proposed crediting period of the project activity.

The quantity of waste gases that would have been generated prior to the start of the project activity *i.e.* $Q_{WG,BL}$ will be calculated as:

$$Q_{WG,BL} = Q_{BL,product} \times q_{wg,product}$$

Where,

$Q_{WG,BL}$ = Quantity of waste gases generated prior to the start of the project activity, calculated as given below ($Nm^3$)

$Q_{BL,product}$ = Production by process that most logically relates to waste gases generation in baseline (in tonnes)

$q_{wg,product}$ = Amount of waste gases the industrial facility generates per unit of product generated by the process that generates waste gases ($Nm^3$/ton)

Determination of $EF_{elec,i,j,y}$

The $CO_2$ emission for the coal based captive power plant which otherwise would have been set up in absence of the project activity will be calculated following the guidance of the methodology as given below:

$$EF_{Elec,is,j,y} = \frac{EF_{CO2,is,j}}{n_{Plant,j}} \times 3.6 * 10^{-3}$$

Where,

$EF_{elec,i,j,y}$ = $CO_2$ emission for the electricity source *i* (*i.e.* the coal based captive power plant), displaced due to the project activity during the year y (in tonnes $CO_2$/MWh)

$EF_{CO2,is,j}$ = $CO_2$ emission factor per unit of energy of the fossil fuel (coal) used in the baseline generation source i (in $tCO_2$ / TJ), obtained from reliable local or national data if available, otherwise, taken from the country specific IPCC default emission factors

$n_{Plant,j}$ = Overall efficiency of the existing plant that would be used by $j^{th}$ recipient in the absence of the project activity

Efficiency of the power plant ($n_{.plant,j}$) will be determined following Option (ii) of the methodology *i.e.* highest of the efficiency values provided by two or more manufacturers for power plants with specifications similar to that which would have been required to supply the recipient with electricity that it receives from the project activity.

Computation of Project Emissions

As per the guidance of the methodology, project emissions will include:

- Emissions from consumption of auxiliary fuel to supplement the heat content of the waste gases and
- Emissions from consumption of electrical energy for cleaning of waste gases prior to its utilization for generation of electrical energy

Therefore following the methodological guidance, the project emissions will be computed as:

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

Where:

$PE_y$ = Project emissions during the year y (in tonnes of $CO_2$)

$PE_{AF,y}$ = Project activity emissions from on-site consumption of fossil fuels by the power plant, in case they are used as supplementary fuels, due to non-availability of waste gases to the project activity or due to any other reason (in tonnes of $CO_2$)

$PE_{EL,y}$ = Project activity emissions from on-site consumption of electricity for gas cleaning equipment (in tonnes of $CO_2$)

'y' is any year within the proposed crediting period of the project activity.

However, as stated above in Section B.3 of the PDD, no additional waste gases cleaning will be required in the project scenario than that in the baseline scenario. Therefore there will not be any additional energy consumption due to cleaning of waste gases in the project scenario and hence

$$PE_{EL,y} = 0$$

Therefore,

$$PE_y = PE_{AF,y}$$

The project emissions from on-site fossil fuel consumption will be computed following the guidance of the methodology as given below:

$$PE_{AF,y} = \sum FF_{i,y} \times NCV_i \times EF_{CO2,i}$$

Where:

$PE_{AF,y}$ = Project activity emissions from on-site consumption of fossil fuels by the power plant, in case they are used as supplementary fuels, due to non-availability of waste gases to the project activity or due to any other reason (in tonnes of $CO_2$)

$FF_{i,y}$ = Quantity of fossil fuel type *i* combusted to supplement waste gases in the project activity during the year y, (in tonnes)

$NCV_i$ = Net calorific value of the fossil fuel type *i* combusted as supplementary fuel, (in TJ/ton)

$EF_{CO2,i}$ = $CO_2$ emission factor per unit of energy of the fuel type i (in tonnes of $CO_2$/TJ)

'y' is any year within the proposed crediting period of the project activity.

For the project activity under consideration, there is no provision for auxiliary fossil fuel firing in the boilers to supplement the heat content of the waste gases. Therefore no project emission is considered while computing the ex-ante emission reductions resulting from the project activity. However the same will be monitored during the proposed crediting period and in case of any consumption of auxiliary fuel for supplementing the heat content of the waste gases, emission from the same will be determined as given above and will be accounted for during the computation of emission reductions, annually on an ex-post basis.

Computation of Leakage Emissions

The methodology does not require the project proponent to consider any leakage emissions.

Computation of Emission Reductions

As per the methodology, the emission reductions resulting from the project activity will be computed as

$$ER_y = \left(BE_y - PE_y\right)$$

where,

$ER_y$ = Emission reductions resulting from the project activity during the year y (in tonnes of $CO_2$)

$BE_y$ = Baseline emissions during the year y (in tonnes of $CO_2$)

$PE_y$ = Project emissions during the year y (in tonnes of $CO_2$)

'y' is any year within the proposed crediting period of the project activity.

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

The following parameters, required for the computation of baseline emissions and project emissions (and hence emission reductions resulting from the project activity), are standard parameters which will not be monitored throughout the crediting period and will remain fixed for the entire crediting period. The same will be provided to the Validator during validation of the project activity.

Fixed parameters for the computation of Baseline Emissions

1. Parameters related to computation of $f_{cap}$

| **Data / Parameter:** | $Q_{WG,BL}$ |
|---|---|
| Data unit: | $Nm^3$ |
| Description: | Quantity of waste gases generated prior to the start of the project activity |
| Source of data used: | Manufacturers' Specifications |
| Value applied: | 2998357895 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The parameter is calculated based on:<br>▪ Production by process that most logically relates to waste gases generation in baseline<br>▪ Amount of waste gases the industrial facility generates per unit of product generated by the process that generates waste gases |
| Any comment: | The parameter is calculated based on two parameters of higher accuracy levels (as described below). Therefore the reliability of the parameter is ensured. |

| **Data / Parameter:** | $Q_{BL,product}$ |
|---|---|
| Data unit: | tonnes/annum |
| Description: | Production by process (*i.e.* sponge iron manufacturing in DRI kilns, pig iron manufacturing in Mini Blast Furnace and coke manufacturing in Coke Ovens) that most logically relates to waste gases generation in baseline |

| | |
|---|---|
| Source of data used: | Manufacturers' Specifications |
| Value applied | DRI kiln: 3,00,000 TPA of sponge iron<br>Blast Furnace: 2,27,500 TPA of pig iron<br>Coke Oven: 4,00,000 TPA of coke |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The parameter is provided by the manufacturer (third party) based on the design specifications of the DRI kilns, Mini Blast Furnace and Coke Ovens. |
| Any comment: | Consideration of manufacturer's data will ensure the reliability of the parameter. . |

| **Data / Parameter:** | $q_{wg,product}$ |
|---|---|
| Data unit: | $Nm^3/ton$ |
| Description: | Amount of waste gases the industrial facility generates per unit of product (*i.e.* sponge iron, pig iron and coke) generated by the process (*i.e.* sponge iron manufacturing, pig iron manufacturing and coke production) that generates waste gases |
| Source of data used: | Manufacturer's Specifications |
| Value applied | DRI kiln: 4800 $Nm^3$/ton sponge iron<br>Blast Furnace: 857 $Nm^3$/ton pig iron<br>Coke Oven: 3408 $Nm^3$/ton coke |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Manufacturer's Specification. |
| Any comment: | Consideration of manufacturer's data will ensure the reliability of the parameter. |

2. Parameters related to computation of $f_{WG}$

The parameter will be monitored during the proposed crediting period of the project activity. Please refer to Section B.7.1 of the PDD for further details.

3. Parameters related to computation of $EG_{i,j,y}$

The parameter will be monitored during the proposed crediting period of the project activity. Please refer to Section B.7.1 of the PDD for further details.

4. Parameters related to computation of $EF_{elec,is,j,y}$

| **Data / Parameter:** | $n_{Plant,j}$ |
|---|---|
| Data unit: | - |
| Description: | Overall efficiency of the existing plant that would be used by $j^{th}$ recipient in the absence of the project activity |
| Source of data used: | Manufacturers Data |

| | |
|---|---|
| Value applied | 0.30 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Efficiency of the power plant will be determined as the highest of the efficiency values provided by two or more manufacturers for power plants with specifications similar to that which would have been required to supply the recipient with electricity that it receives from the project activity. |
| Any comment: | Consideration of the highest efficiency will ensure reliability of the parameter. |

Fixed parameters for the computation of Project Emissions

The parameters required for the computation of project emissions will be monitored during the proposed crediting period of the project activity. Please refer to Section B.7.1 of the PDD for further details.

### B.6.3. Ex-ante calculation of emission reductions:

Ex-ante estimation of Baseline Emissions

The ex-ante computation of baseline emission for the project activity (please refer to 'Annex-3: Baseline Information' for detail computation) is tabulated below:

| Sl. No. | Operating Year | Baseline Emission (tonnes of $CO_2$ e) |
|---|---|---|
| 1. | April 2009 – March 2010 | 341077 |
| 2. | April 2010 – March 2011 | 341077 |
| 3. | April 2011 – March 2012 | 341077 |
| 4. | April 2012 – March 2013 | 341077 |
| 5. | April 2013 – March 2014 | 341077 |
| 6. | April 2014 – March 2015 | 341077 |
| 7. | April 2015 – March 2016 | 341077 |
| 8. | April 2016 – March 2017 | 341077 |
| 9. | April 2017 – March 2018 | 341077 |
| 10. | April 2018 – March 2019 | 341077 |
| **Total** | | **3410770** |

Ex-ante estimation of Project Emissions

As described above in Section B.6.1 above, there will be no project emission from the project activity and hence the project proponent will not consider any project emission for ex-ante computation of emission reductions resulting from the project activity (please refer to 'Annex-3: Baseline Information' for detail computation). Therefore,

$PE_y = 0$

where,

$PE_y$ = Project Emissions in the year y ($tCO_2$)

However the combustion of fossil fuel during generation start up or in emergencies in the project activity will be monitored and the project emission will be computed on the basis of the fossil fuel combustion during any year within the proposed crediting period. The same will be up-dated annually on an ex-post basis.

Ex-ante estimation of Emission Reductions

The ex-ante computation of emission reductions resulting from the project activity (please refer to 'Annex-3: Baseline Information' for detail computation) is tabulated as below:

| Sl. No. | Operating Year | Emission Reductions (tonnes of $CO_2$ e) |
|---|---|---|
| 1. | April 2009 – March 2010 | 341077 |
| 2. | April 2010 – March 2011 | 341077 |
| 3. | April 2011 – March 2012 | 341077 |
| 4. | April 2012 – March 2013 | 341077 |
| 5. | April 2013 – March 2014 | 341077 |
| 6. | April 2014 – March 2015 | 341077 |
| 7. | April 2015 – March 2016 | 341077 |
| 8. | April 2016 – March 2017 | 341077 |
| 9. | April 2017 – March 2018 | 341077 |
| 10. | April 2018 – March 2019 | 341077 |
| **Total** | | **3410770** |

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

| Year | Estimation of Proposed project activity Emission reductions (tonnes of $CO_2$ e) | Estimation of baseline Emissions reductions (tonnes of $CO_2$ e) | Estimation of leakage (tonnes of $CO_2$ e) | Estimation of emission reductions (tonnes of $CO_2$ e) |
|---|---|---|---|---|
| April 2009 – March 2010 | 0 | 341077 | 0 | 341077 |
| April 2010 – March 2011 | 0 | 341077 | 0 | 341077 |
| April 2011 – March 2012 | 0 | 341077 | 0 | 341077 |
| April 2012 – March 2013 | 0 | 341077 | 0 | 341077 |
| April 2013 – March 2014 | 0 | 341077 | 0 | 341077 |
| April 2014 – March 2015 | 0 | 341077 | 0 | 341077 |
| April 2015 – March 2016 | 0 | 341077 | 0 | 341077 |
| April 2016 – March 2017 | 0 | 341077 | 0 | 341077 |
| April 2017 – March 2018 | 0 | 341077 | 0 | 341077 |
| April 2018 – March 2019 | 0 | 341077 | 0 | 341077 |
| **Total (tonnes of $CO_2$ e)** | **0** | **3410770** | **0** | **3410770** |

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

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

Reference: Approved consolidated monitoring methodology ACM0012/Version 02, Sectoral Scope 1 and 4

### B.7.1 Data and parameters monitored:

The approved consolidated monitoring methodology requires the project proponent to monitor the following parameters for the computation of baseline emissions, project emissions and hence the emission reductions resulting from the project activity. The parameters and the monitoring procedures are detailed below:

Parameters to be monitored for the computation of Baseline Emissions

1. Parameters related to computation of $f_{cap}$

| **Data / Parameter:** | $Q_{WG,y}$ |
|---|---|
| Data unit: | $Nm^3$ |
| Description: | Quantity of waste gases used for energy generation during year y |
| Source of data to be used: | Plant Records |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 2998357895 |
| Description of measurement methods and procedures to be applied: | The parameter will be monitored continuously with flow meters. The same will also be available in the power plant Distributed Control System (DCS). The Head (Mechanical & Maintenance) will be responsible for regular calibration of the flow meter. The data will be archived both electronically and in paper for the entire crediting period and two years after. |
| QA/QC procedures to be applied: | The flow meter will be calibrated annually and the Head (Mechanical & Maintenance) will be responsible for the calibration. |
| Any comment: | The uncertainty level of the parameter will be low since the same will be monitored with calibrated meters. |

2. Parameters related to computation of $f_{WG}$

| Data / Parameter: | $ST_{whr,y}$ |
|---|---|
| Data unit: | kCal |
| Description: | Energy content of the steam generated in Waste Heat Recovery Boilers of DRI kiln gas and Coke Oven Gas and BFG Boiler and fed to turbine via common steam header |
| Source of data to be used: | Plant Records and Steam Tables |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 1.2424E+12 |
| Description of measurement methods and procedures to be applied: | The parameter will be determined based on<br>▪ Steam flow from the Waste Heat Recovery Boilers of DRI kiln gas and Coke Oven Gas and BFG Boiler- The parameter will be monitored with flow meters and will be available in the power plant Distributed Control System (DCS). The Head (Mechanical & Maintenance) will be responsible for regular calibration of the flow meters. The data will be archived both electronically and in paper for the entire crediting period and two years after.<br>▪ Enthalpy of steam generated- The parameter will be determined based on temperature and pressure of steam generated from the Waste Heat Recovery Boilers of DRI kiln gas and Coke Oven Gas and BFG Boiler using Steam Tables. The temperature of steam generated will be monitored with temperature gauges and the pressure of steam generated will be monitored with pressure gauges. The Head (Mechanical & Maintenance) will be responsible for regular calibration of the temperature and pressure gauges. The data will be archived both electronically and in paper for the entire crediting period and two years after. |
| QA/QC procedures to be applied: | The steam flow meter, temperature gauges to monitor steam temperature and pressure gauges to monitor steam pressure will be calibrated annually and the Head (Mechanical & Maintenance) will be responsible for calibration of the same. |
| Any comment: | The uncertainty level of the parameter will be low since the same will be determined with parameters monitored with calibrated meters. |

| Data / Parameter: | $ST_{other,y}$ |
|---|---|
| Data unit: | kCal |

| | |
|---|---|
| Description: | Energy content of steam generated in other boilers and fed to turbine via common steam header |
| Source of data to be used: | Plant Records and Steam Tables |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 9.8669E+11 |
| Description of measurement methods and procedures to be applied: | The parameter will be determined based on<br>▪ Steam flow from the other boilers- The parameter will be monitored with flow meters and will be available in the power plant Distributed Control System (DCS). The Head (Mechanical & Maintenance) will be responsible for regular calibration of the flow meters. The data will be archived both electronically and in paper for the entire crediting period and two years after.<br>▪ Enthalpy of steam generated- The parameter will be determined based on temperature and pressure of steam generated from other boilers using Steam Tables. The temperature of steam generated will be monitored with temperature gauges and the pressure of steam generated will be monitored with pressure gauges. The Head (Mechanical & Maintenance) will be responsible for regular calibration of the temperature and pressure gauges. The data will be archived both electronically and in paper for the entire crediting period and two years after. |
| QA/QC procedures to be applied: | The steam flow meter, temperature gauges to monitor steam temperature and pressure gauges to monitor steam pressure will be calibrated annually and the Head (Mechanical & Maintenance) will be responsible for calibration of the same. |
| Any comment: | The uncertainty level of the parameter will be low since the same will be determined with parameters monitored with calibrated meters. |

3. Parameters related to computation of $EG_{i,j,y}$

| | |
|---|---|
| **Data / Parameter:** | $EG_{i,j,y}$ |

| | |
|---|---|
| Data unit: | MWh |
| Description: | Quantity of electricity supplied to the recipient *j* by generator which in the absence of the project activity would have been sourced from the $i^{th}$ source (*i.e.* the coal based captive power plant) during the year y |
| Source of data to be used: | Plant Records |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 530666 |
| Description of measurement methods and procedures to be applied: | The parameter will be measured continuously (online measurement) with energy meter and the same will be available in the plant's Distributed Control System (DCS). The Head (Mechanical & Maintenance) will be responsible for regular calibration of the energy meters. The data will be archived both electronically and in paper for the entire crediting period and two years after. |
| QA/QC procedures to be applied: | The energy meter will be calibrated annually and the Head (Mechanical & Maintenance) will be responsible for calibration of the same. |
| Any comment: | The uncertainty level of the parameter will be low since the same will be monitored with calibrated meters. |

4. Parameters related to computation of $EF_{elec,i,j,y}$

| **Data / Parameter:** | $EF_{elec,i,j,y}$ |
|---|---|
| Data unit: | $tCO_2$/ MWh |
| Description: | $CO_2$ emission for the electricity source *i* (*i.e.* the coal based captive power plant), displaced due to the project activity during the year y |
| Source of data used: | Plant Records |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 1.153 |
| Description of measurement methods and procedures to be applied: | The parameter will be calculated based on:<br>▪ $CO_2$ emission factor per unit of energy of the fossil fuel (coal) used in the baseline generation source i and<br>▪ Overall efficiency of the existing plant that would be used by $j^{th}$ recipient in the absence of the project activity<br>The data will be archived both electronically and in paper for the entire crediting period and two years after. |
| QA/QC procedures: | - |
| Any comment: | The parameter will be determined based on two parameters (as described above) with lower uncertainty levels. This will ensure the reliability of the parameter. |

| **Data / Parameter:** | $EF_{CO2,is,j}$ |
|---|---|
| Data unit: | $tCO_2$ / TJ |
| Description: | $CO_2$ emission factor per unit of energy of the fossil fuel (coal) used in the baseline generation source i |

| | |
|---|---|
| Source of data used: | Plant Records/ National Sources/ 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 96.1 |
| Description of measurement methods and procedures to be applied: | The parameter will be determined following the standard testing practice. In absence of plant specific data, country specific data or IPCC default values will be used. |
| QA/QC procedures: | - |
| Any comment: | Determination of the parameter following the standard testing practice will ensure the reliability of the parameter. In absence of authentic plant specific data, country specific data or IPCC default values will be used to ensure reliability of the parameter. |

Parameters to be monitored for the computation of Project Emissions

| **Data / Parameter:** | $FF_i$ |
|---|---|
| Data unit: | tonnes |
| Description: | Quantity of fossil fuel type *i* combusted to supplement waste gases in the project activity during the year y |
| Source of data to be used: | Plant Records |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 0 |
| Description of measurement methods and procedures to be applied: | The parameter will be measured continuously (*i.e.* whenever auxiliary fuel will be consumed) with a properly calibrated flow meter/weighing system. The data will be archived both electronically and in paper for the entire crediting period and two years after. |
| QA/QC procedures to be applied: | The flow meter will be calibrated annually and the Head (Mechanical & Maintenance) will be responsible for calibration of the same |
| Any comment: | Regular calibration of the flow meter/weighing system will ensure the reliability of the parameter. If possible, fuel purchase receipt will also be used to cross-verify the data. |

| **Data / Parameter:** | $NCV_i$ |
|---|---|
| Data unit: | TJ/ton |
| Description: | Net calorific value of the fossil fuel type *i* combusted as supplementary fuel |
| Source of data to be used: | Plant Records/ National Sources/ 2006 IPCC Guidelines for National Greenhouse Gas Inventories |

| | |
|---|---|
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 0.043 (considering light diesel oil)<br>0.0189 (considering sub-bituminous coal)<br>*For any other fuel type, the same standard will be used.* |
| Description of measurement methods and procedures to be applied: | The parameter will be determined following the standard testing practice. In absence of plant specific data, country specific data or IPCC default values will be used. |
| QA/QC procedures to be applied: | - |
| Any comment: | Determination of the parameter following the standard testing practice will ensure the reliability of the parameter. In absence of authentic plant specific data, country specific data or IPCC default values will be used to ensure reliability of the parameter. |

| | |
|---|---|
| Data / Parameter: | $EF_{CO2,i}$ |
| Data unit: | $tCO_2/TJ$ |
| Description: | $CO_2$ emission factor per unit of energy of the fuel type i |
| Source of data to be used: | Plant Records/ National Sources/ 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 74.1 (considering diesel oil)<br>96.1 (considering sub-bituminous coal)<br>*For any other fuel type, the same standard will be used.* |
| Description of measurement methods and procedures to be applied: | The parameter will be determined following the standard testing practice. In absence of plant specific data, country specific data or IPCC default values will be used. |
| QA/QC procedures to be applied: | - |
| Any comment: | Determination of the parameter following the standard testing practice will ensure the reliability of the parameter. In absence of authentic plant specific data, country specific data or IPCC default values will be used to ensure reliability of the parameter. |

### B.7.2. Description of the monitoring plan:

Please refer to 'Annex-4: Monitoring Plan' of the PDD for detail description of the Monitoring Plan.

## 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):** |
|---|

| **Parameter** | **Details** |
|---|---|
| Date of completing the final draft of this baseline selection and monitoring plan | 30/12/2008 |
| Name of person/ entity determining the baseline and establishing the monitoring plan | Visa Steel Limited |

## 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:

28/03/2006- Release of first Letter of Intent

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

25y 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:

Not Applicable.

#### C.2.1.2. Length of the first crediting period:

Not Applicable.

### C.2.2. Fixed crediting period:

#### C.2.2.1. Starting date:

01/04/2009 or registration with UNFCCC whichever is later

#### C.2.2.2. Length:

10y 0 m

## SECTION D. Environmental impacts

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

Article 12 of the Kyoto Protocol requires that a CDM project activity contributes to the sustainable development of the host country. Assessing the project activity's positive and negative impacts on the local environment and on society is thus a key element for each CDM project. Visa Steel Limited proposes to implement the project activity because of its commitment to ensure maximum global and local benefits in relation to certain environmental and social issues and is a major step towards sustainable development.

The project activity of installation of a waste gas based power plant is a component of the Greenfield integrated iron and steel plant to be set up by Visa Steel Limited. A 'Rapid Environmental Impact Assessment (REIA)' has been conducted for the steel plant which includes all the aspects of the project activity implementation, its impacts on the baseline environment which prevailed before its implementation and the mitigation measures (*i.e.* Environmental Management Plan) planned in order to minimise the adverse environmental impacts, if any. The impacts of the project activity have been dealt in the following section (as predicted in the REIA study) in three distinct phases of its implementation namely:

- Impacts during Construction phase
- Impacts during Operational phase and
- Impacts during Maintenance phase

| Impacts during Construction phase | | |
|---|---|---|
| Activity: This primarily includes construction of the power plant, erection of the boilers, the steam-turbo generator sets and other power plant equipments, installation of the ducting system for transportation of steam and installation of power evacuation system. All these activities will have minor impacts on the following baseline parameters as discussed below: | | |
| Environmental /Social Parameters | Impacts / Activities | Recommendations/ Implementation/ Remarks |
| Air | During the construction phase of the project activity, there will be a marginal increase in the dust emission level. The effect, although direct, will be for short term, reversible, minor and confined to the plant site | Visa Steel Limited will ensure sprinkling of water during construction phase to suppress dust emissions. They will also monitor vehicular emissions in order to be within the norms and to ensure |

| | | |
|---|---|---|
| | | minimum pollution. |
| Soil | The construction activity will involve site levelling operations, site preparation and erection of utilities which will result in a minimal quantum of soil movements. However the same will be for a very short spell of time and therefore the impacts are not considered to be significant. | The impacts are expected to be stabilized during the operational phase of the project activity. Hence, soil conservation and afforestation programmes are not required. |
| Noise | Site preparatory work and erection of various utilities during the construction phase of the project activity will change the noise generation level within the plant premise to certain extent. However the impact will be primarily confined within the plant premise. | Visa Steel Limited will ensure use of silencers on noise generating machines (wherever possible) and distribute ear plugs or ear-muffs to the workers in the noisy zones. |
| Social and Economic | No dislocation of population will be required to facilitate the construction activities. Further the construction of the power plant will generate employment opportunities for the local people on a temporary basis which will help them improvising their quality of life. | No rehabilitation of population will therefore be required. However Visa Steel Limited has decided to set up new schools in the area, construct roads, sewerage facilities and other infrastructural facilities for the project personnel and their families. |

| Impacts during Operational phase | | |
|---|---|---|
| Activity: During operational phase, the project activity will utilise the heat content of the waste gases of the DRI kilns, Mini Blast Furnace and the Coke Ovens to generate power. The following impacts are envisaged during the operational phase of the project activity: | | |
| Environmental/ Social Parameters | Impacts / Activities | Recommendations/ Implementation/ Remarks |
| Ambient Air Quality | The project activity for generation of power through utilisation of the heat content of the waste gases is a cleaner means of power generation. This will replace fossil fuel based power generation from a coal based captive power plant and hence the emissions from the same. Furthermore the project activity, by preventing the loss of useful heat energy of | This is a positive step towards air quality improvement. Visa Steel Limited will constantly monitor all the Ambient Air Quality parameters in and around the plant site and non-conformance of any one of them with the prescribed standards |

| | | |
|---|---|---|
| | the waste gases of the DRI kilns, Mini Blast Furnace and the Coke Ovens to the atmosphere, will reduce the thermal pollution of the local environment. | will be addressed with top priority. |
| Ground Water | The ground water will not be directly used in the project activity. However there may be some use of ground water by people involved in secondary development of the area. | Visa Steel Limited will ensure recharge of ground water through various impoundments. |
| | The steel complex is designed to operate on a zero discharge concept. The entire plant built up area will be concreted. Reused and excess water will be collected through catch basins to internal drains. | Visa Steel Limited, as a regulatory requirement, will monitor the plant discharge. Adequate measures will be undertaken in case any non-conformity is identified. |
| Noise Generation | An increase in noise level is anticipated with the implementation of the project activity which includes operation of vibrating equipment like steam turbo-generators. However the same is expected to be confined within Visa Steel Limited Works boundary thereby minimising the impacts on the local habitats. | Visa Steel Limited will ensure that the noise level in the operating area shall not exceed the prescribed limits. Noise monitoring will also be carried out in township in day and night to observe the effect of industrial activities on noise level. Appropriate mitigation measures will be adopted in case the noise level exceeds the stipulated value. |

| Impacts during Operational phase | | |
|---|---|---|
| Environmental/ Social Parameters | Impacts / Activities | Recommendations/ Implementation/ Remarks |
| Land Environment | All solid wastes will be dumped in a systematic manner and land will not be polluted due to the project activity | Systematic dumping will have minimum or no impact on the surrounding land environment. Further to minimise this minimal impact, Visa Steel Limited will utilise the solid waste for road making *etc*. |
| Solid Waste Management | The project activity will not lead to any additional solid waste generation since only the heat content of the waste gases will be utilised for generation of steam and subsequently power. | No solid waste management plan is therefore required. |

| | | |
|---|---|---|
| Natural Resource Conservation | The project activity will replace fossil fuel (coal) based power generation at a captive power plant thereby conserving an equivalent quantum of non-renewable fossil fuel-coal. | This is a positive step towards non-renewable resource – coal conservation. |
| Ecology- Flora and Fauna | The emissions, discharge of solid and liquid effluents may have some impact on the local flora. Cutting of trees and vegetal cover for facilitation of the project activity, although limited to the extent possible, may cause loss of habitats for fauna. Furthermore the noise generated from the project activity will have some impact on the fauna. | The impact on local flora is expected to be contained within the battery limit. Greenbelt development shall be taken up as a part of the project activity implementation. Soil binding plants (*e.g.* grass) will be planted wherever feasible. Care shall be taken not to kill fauna during clearing up of lands. Operation of noise producing equipment will be avoided during night time to avoid impacts on fauna. |
| Social | The project activity will generate employment opportunities for the local people for successful operation of the power plant. This will help them to develop professional skills in the field of power plant operation. Furthermore this will improve the quality of life of the local people. Moreover a pollution free work area will ensure safety and health of the employees at the workplace. | Visa Steel Limited is always committed to provide better work area environment at shop floors. Upkeep of the workplace, proactive maintenance and effective running of the pollution control devices will substantially contribute in maintaining a clean and healthy work environment. |

Impacts during Maintenance phase

Activity: An annual shut down of the power plant will be planned every year for ensuring proper maintenance of the power plant equipment. Since this will be for a very short span of time, hence no significant environmental impacts are envisaged during this phase. The only impact during this phase, as envisaged, is detailed below:

| Environmental /Social Parameters | Impacts / Activities | Recommendations/ Implementation/ Remarks |
|---|---|---|
| Solid Waste Management | In the maintenance phase some oily cloth, waste and scrap will be generated after cleaning but it will not cause any adverse impact on the environment. | Visa Steel Limited will ensure the reuse and recycle of solid wastes to improve the business performance and the environmental performance of the organization. |

**D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:**

As explained above, the project activity will be implemented as a part of the Greenfield integrated iron and steel plant of Visa Steel Limited. The 'Rapid Environmental Impact Assessment (REIA)' study conducted for the steel plant includes all the aspects of the project activity implementation which has been elaborated above. The project activity is a cleaner mean of power generation which will reduce the dependency of Visa Steel Limited on fossil fuel (coal) based power generation. Furthermore, by utilising the heat content of the waste gases, which otherwise would have been wasted, the project activity will reduce thermal pollution of the local environment. Therefore the project activity primarily has only positive environmental impacts. However the project performance will be monitored as a part of the regular Environmental Monitoring Plan of Visa Steel Limited and negative impacts, if any, will immediately be taken care off.

## SECTION E. Stakeholders' comments

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

As a responsible corporate citizen, Visa Steel Limited is always committed to maintain their professional standards in their business performance. Stakeholder consultation is therefore considered as an integral component of every project implementation at Visa Steel Limited. All the stakeholders have been identified and requested to provide their feedbacks/ suggestions on the project activity. The issues identified by the stakeholders have been discussed by the Management of Visa Steel Limited and necessary actions have been undertaken.

The stakeholder consultation is generally carried out in a phased manner at Visa Steel Limited. The same is explained below:

Table-E.1: Stakeholder Consultation Protocol

| Phase | Activity |
|---|---|
| Phase-I: Identification of | All the parties involved with the project activity at any stage of its implementation (*i.e.* from conceptualisation to actual implementation) are considered to be a potential stakeholder for the project activity. For the project activity under consideration, the |

| Table-E.1: Stakeholder Consultation Protocol | |
|---|---|
| Phase | Activity |
| Stakeholders | following government and non-government parties and organizations are identified as the stakeholders:<br>▪ Village Panchayat<br>▪ Employees of Visa Steel Limited<br>▪ Consultants<br>▪ Equipment Suppliers<br>▪ Non-Governmental Organizations (NGOs)<br>▪ Orissa Pollution Control Board (OPCB)<br>▪ Ministry of Environment and Forests, Government of India |
| Phase-II: Information Sharing | The representatives from Visa Steel Limited have explained to the identified stakeholders and shared with them the salient features of the project activity and its probable socio-economic and environmental impacts on the locality. They are encouraged to give their feedbacks either verbally or through written communications on all the aspects of the project activity implementation and its operation. |
| Phase-III: Compilation of the comments received and measures undertaken | The comments received from all the stakeholders are compiled and their significance is considered by the project team of Visa Steel Limited. Appropriate measures are undertaken to address the issues raised by the stakeholders. In case of any significant comment received from the stakeholders, the same is escalated to the Management Level and necessary actions are implemented by the Management of Visa Steel Limited. |

## E.2. Summary of the comments received:

| Table-E.2: Summary of Stakeholder Consultation | | | | |
|---|---|---|---|---|
| Sl No. | Name of Stakeholders | Mode of Communication | Feedback | Status |
| Comments received from Non-Governmental Parties | | | | |
| 1. | Village Panchayats | Representatives of Visa Steel Limited has reached out to the Gram Panchayat Pradhans who represent the local people and explained to them the salient features of the project activity. They are requested to provide their feedbacks on the same. | The Gram Panchayat Pradhans have acknowledged the positive socio-economic and environmental impacts of the project activity. They commended Visa Steel Limited's initiative of implementing the project activity without causing any population dislocation and their role in generating local employment opportunities. They have | Visa Steel Limited has received a written consent from the Village Panchayat for the project activity. |

| Table-E.2: Summary of Stakeholder Consultation | | | | |
|---|---|---|---|---|
| Sl No. | Name of Stakeholders | Mode of Communication | Feedback | Status |
| | | | assured their support to the Management of Visa Steel Limited. | |
| 2. | Employees of Visa Steel Limited | The employees of Visa Steel Limited have been communicated about the project activity implementation. | The employees have realized the positive attributes of the project activity. They have appraised the Management's decision to implement the project activity and assured their support for the same. | The Management of Visa Steel Limited has received a written consent from the employees for the project activity. |
| 3. | Consultants | Brief details on the project activity implementation and its associated impacts are verbally explained to the consultants and the equipment suppliers of the project activity. | The consultants and the equipment suppliers are involved with the project activity at every stage of its implementation. The project activity has generated a lot of business opportunities for them. They have appreciated the initiative of Visa Steel Limited and provided their support throughout to make it successful. | Visa Steel Limited has received a positive feedback from their consultant and equipment suppliers. |
| 4. | Equipment Suppliers | | | |
| 5. | Non-Governmental Organizations (NGOs) | The project activity details, its associated environmental impacts and its contribution towards the up-liftment of the social and economic structure of the locality have been briefed to the NGO through a letter and their opinion on the same is requested for. | The NGO has appreciated the initiative of Visa Steel Limited towards socio-economic development of the locality and their commitment towards developing an environment friendly manufacturing process. | Visa Steel Limited has received a written consent from the NGO for the project activity. |
| Comments received from Government Parties | | | | |

| Table-E.2: Summary of Stakeholder Consultation | | | | |
|---|---|---|---|---|
| Sl No. | Name of Stakeholders | Mode of Communication | Feedback | Status |
| 6. | Orissa Pollution Control Board (OPCB) | Orissa Pollution Control Board (OPCB) and Environment Department of Government of Orissa have prescribed standards of environmental compliance and monitor the adherence to the standards. The relevant information of the project activity was presented in the Public Hearing conducted on 13.09.2006. | The project activity has been appraised by OPCB and the Environment Department. The environmental parameters will be monitored by OPCB as per the statutory requirements. | The project activity has received the Consent to Establish (or No Objection Certificate (NOC)) and the Consent to Operate from OPCB as per provisions under Section 29/26 of Water (Prevention & Control of Pollution) Act, 1974 & Section 21 of Air (Prevention & Control of Pollution) Act, 1981 before the commissioning of the plant. |
| 7. | Ministry of Environment and Forests, Government of India | The Project Design Document and the Project Concept Note have been submitted to MoEF for their consideration. The project activity details have also been presented. | The project activity has been developed following the guidelines proposed by Ministry of Environment & Forests, Government of India in order to ensure environmental quality. | The project proponent has received the Host Country Approval from Ministry of Environment & Forests, Government of India for the project activity. |

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

Visa Steel Limited has so far received only positive feedbacks on the project activity from all the stakeholders. However stakeholder consultation is an on-going process and the project proponent will continue the process. All the comments received, so far, have been considered and given due consideration while preparing the CDM Project Design Document.

Furthermore, as per the requirement of UNFCCC, the CDM Project Design Document will be web-hosted on the DOE's (Designated Operational Entity) website for a period of one month for global stakeholder consultation. The comments received by the Validator during the period of global stakeholder consultation will be properly addressed as a part of CDM process.

## Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
| Organization: | Visa Steel Limited |
| Street/P.O.Box: | Kalinganagar Industrial Complex |
| Building: | - |
| City: | District- Jajpur |
| State/Region: | Orissa |
| Postcode/ZIP: | Jakhapura – 755026 |
| Country: | India |
| Telephone: | +91 - 6726 242441 |
| FAX: | +91 - 6726 242442 |
| E-Mail: | visasteel@sify.com |
| URL: | www.visasteel.com |
| Represented by: | |
| Title: | Asst. General Manager (Chairman's Office) |
| Salutation: | Mr. |
| Last name: | Sengupta |
| Middle name: | |
| First name: | Prabal |
| Department: | Power Projects |
| Mobile: | +91 - 9830013757 |
| Direct FAX: | +91 - 33-30519000 |
| Direct tel: | +91 - 33-30519003 |
| Personal e-mail: | prabal.sengupta@visasteel.com |

## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

No public funding for this project

## Annex 3

## BASELINE INFORMATION

| Computation of Emission Reductions | | | | |
|---|---|---|---|---|
| Parameter | Parameter | Unit | Value | Comments/ Assumptions |
| Computation of Baseline Emissions | | | | |
| Determination of $f_{cap}$ | | | | |
| Quantity of waste gases generated prior to the start of the project activity | $Q_{WG,BL}$ | $Nm^3$ | 2998357895 | |
| Quantity of waste gases used for energy generation during year y | $Q_{WG,y}$ | $Nm^3$ | 2998357895 | |
| Energy that would have been produced in project year y using waste gases generated in base year expressed as a fraction of total energy produced using waste gases in year y | $f_{cap}$ | | 1.00 | |
| Determination of $f_{WG}$ | | | | |
| Energy content of the steam generated in Waste Heat Recovery Boilers of DRI kiln gas and Coke Oven Gas and BFG Boiler and fed to turbine via common steam header | $ST_{WHR,y}$ | kCal | 1.2424E+12 | |
| Energy content of steam generated in other boilers fed to turbine via common steam header | $ST_{other,y}$ | kCal | 9.8669E+11 | |
| Fraction of total electricity generated by the project activity using waste gas | $f_{wg}$ | | 0.56 | |
| Determination of $EF_{Elec,i,j,y}$ | | | | |
| $CO_2$ emission factor per unit of energy of the fossil fuel (coal) used in the baseline generation source i | $EF_{CO2,ls,j}$ | $tCO_2/TJ$ | 96.1 | 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Overall efficiency of the existing plant that would be used by $j^{th}$ recipient in the absence of the project activity | $n_{Plant,j}$ | | 0.30 | Highest of the efficiency values provided by two or more manufacturers for power plants with specifications similar to that which would have been required to supply the recipient with electricity that it receives from the project activity |
| $CO_2$ emission for the electricity source i (*i.e.* the coal based captive power plant), displaced due to the project activity during the year y | $EF_{elec,i,j,y}$ | $tCO_2/MWh$ | 1.153 | |
| Determination of $EG_{i,j,y}$ | | | | |
| Quantity of electricity supplied to the recipient *j* by generator which in the absence of the project activity would have been sourced from the $i^{th}$ source (*i.e.* the coal based captive power plant) during the year y | $EG_{i,j,y}$ | MWh | 530666 | |
| Baseline Emissions during the year y | $BE_y$ | $tCO_2$ | 341077 | |
| Project Emissions during the year y | $PE_y$ | $tCO_2$/annum | 0 | |
| Emission Reductions resulting from the project activity during the year y | $ER_y$ | $tCO_2$/annum | 341077 | |

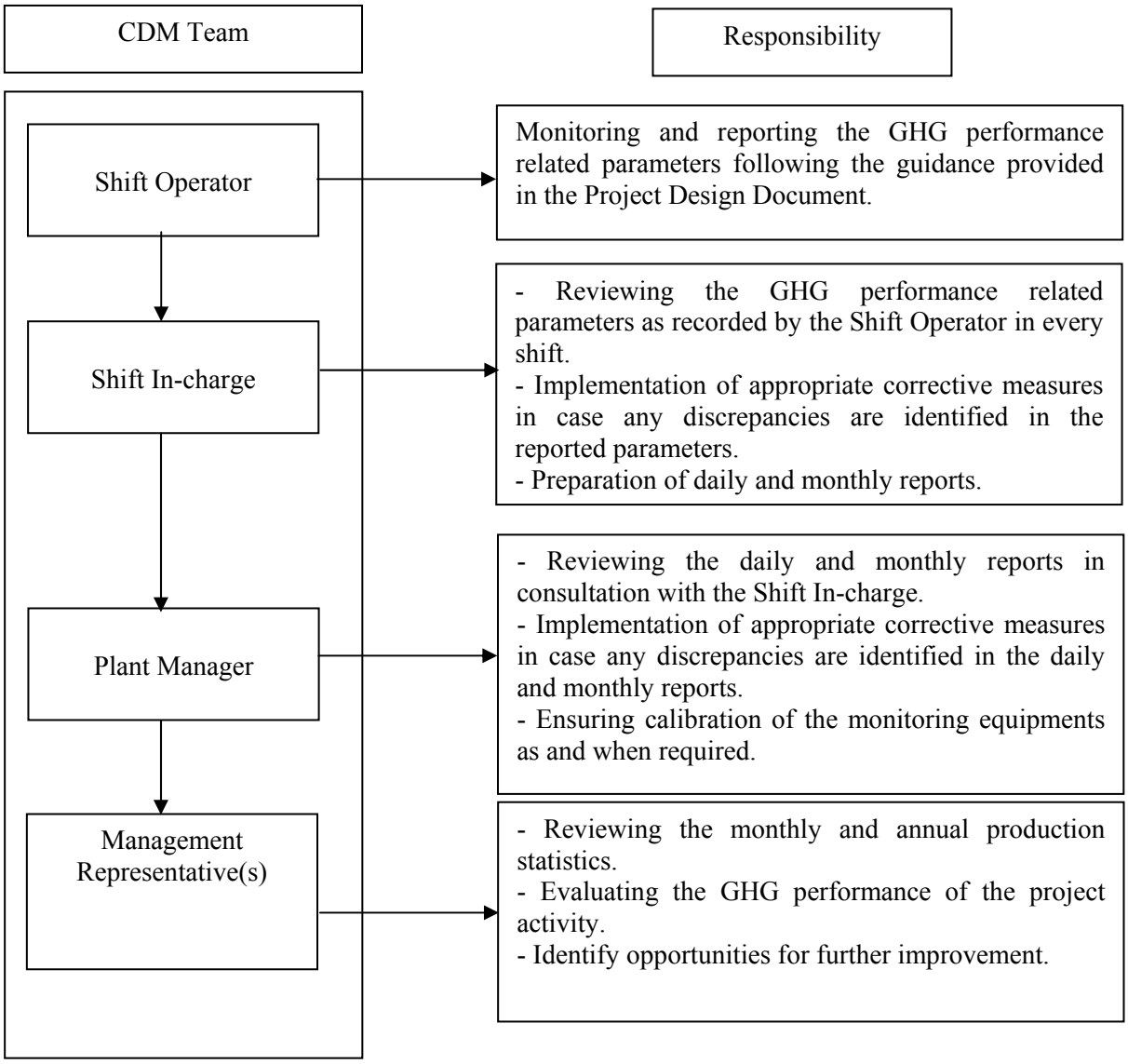
## Annex 4

## MONITORING INFORMATION

The project activity will result in emission reductions by generating power with the heat content of the waste gases emanated from the DRI kilns, Mini Blast Furnace and the Coke Ovens thereby offsetting more carbon intensive power generation at a coal based captive power plant. The financial performance of the project activity depends significantly on the CDM revenue to be availed through sale of Certified Emission Reduction (CER) units accrued from the project activity. This will require proper monitoring of all the relevant GHG performance parameters. Therefore the project proponent has developed a robust monitoring protocol which will be followed throughout the proposed crediting period in order to ensure proper operation of the project activity resulting in generation of carbon credits. This includes a range of data measurement, estimation and collection options/techniques in each case indicating preferred options consistent with good practices to allow project managers and operational staff, auditors, and verifiers to apply the most practical measurement approaches for the project activity. The same is explained below:

| Table An-4.1: Monitoring Plan |
|---|
| 1.0 Objective |
| ▪ To ensure proper monitoring and recording of all the parameters required for the computation of emission reductions from the project activity<br>▪ To ensure proper evaluation of the project activity performance at regular intervals<br>▪ To identify the discrepancies in the data monitoring, recording and archiving system and to open up the opportunities for future improvement |
| 2.0 Instrumentation and Control System |
| The instrumentation and control system is the key aspect for salubrious functioning of any monitoring and verification system of a project activity. The project activity has employed the state of the art monitoring and control equipment that will measure, record, report, monitor and control various key parameters like quantity waste gases utilised for power generation, total power generated, power used for auxiliary consumption, in-house power consumption, steam flow rate, temperature and pressure parameters of the steam generated, any fossil fuel consumption, its calorific value and $CO_2$ emission factor. The instrumentation and control system for the power plant will be designed with microprocessor-based instruments having adequate provisions to control and monitor the various operating parameters for safe and efficient operation of the boilers and the steam turbo-generator unit. |
| 3.0 Roles and Responsibilities |

The project proponent has developed a 'CDM Team' who will be involved in monitoring, reporting and verification of all the GHG performance related parameters. The following schematic diagram will explain the individual roles and responsibilities of all the members of the 'CDM Team':




4.0 Internal Audit

Internal Audit will be conducted once in a year in order to assess the GHG performance of the project

| |
|---|
| activity. Auditors will consist of people from different departments of Visa Steel` Limited. The audit findings and the necessary corrective actions will be documented and reported to the Management Representative(s) for their immediate actions. The Plant Management will also be informed on the same. Compliance with the audit findings and evaluation of implementation of the corrective actions will be a part of the subsequent audit. |
| 5.0 Experience and Training |
| The Plant Manager will be qualified engineer/ diploma holder with prior work experience. The Shift In-charge will be diploma holder. All the Shift Operators will be provided with extensive on-the-job trainings under the guidance of the Shift In-charge which will include training on plant operations, data monitoring and report generation. |

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