

# Validation Report

for:

Vision Sponge Iron Private Ltd

Validation of CDM project for

Waste Heat Recovery Based Power  
Generation at Vision Sponge Iron  
Private Limited, West Bengal, India

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## 1 Executive Summary

Lloyd's Register Quality Assurance Limited has been contracted by Vision Sponge Iron Private Ltd (VSIPL), the project participants (PP), to undertake validation of the proposed project activity "Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India" located at Purulia, West Bengal, India. The validation has been performed through a process of document review based on the project design document Version 01 dated 29/02/2008 initially submitted for validation and the subsequent revisions, follow-up interviews with the stakeholders, resolution of outstanding issues and issuance of the validation report.

The project activity involves utilization of sensible heat content of the Direct Reduction Iron (DRI) Kiln waste gas and generating electricity using the waste heat. The existing sponge iron manufacturing facility of VSIPL with 2 DRI Kilns will be expanded further by addition of 3 new DRI Kilns, each of 100tpd capacity and 5 Waste Heat Recovery Boilers (WHRBs) would be connected to the respective DRIs. The electricity would be generated by using the waste heat from the 5 DRIs and 1 fluidized bed combustion (FBC) boiler connected to a single steam turbine generator that will be installed at the project activity site.

The fulfilment of the requirements as set forth in Article 12 of the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC), the modalities and procedures for a CDM (CDM M&P), and relevant decisions of the Conference of the Parties, serving as meeting of the Parties to the Kyoto Protocol (COP/MOP) and the executive board of the CDM (CDM-EB) have been evaluated and conformance to the validation requirements were confirmed based on the given information. 14 Corrective action requests (CARs) and 13 clarifications (CLs) were raised for relevant actions by the PP.

The validation team is of the opinion that the proposed project activity as described in the project design document Version 03 dated 19/05/2009 meets all the relevant UNFCCC requirements for the CDM, as well as the host country's national requirements and if implemented as designed, is likely to achieve the emission reductions and contribute to the sustainable development of the host country. LRQA therefore requests the registration of "Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India" to the CDM Executive Board as a CDM project activity.

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## Abbreviations

ABC	After Burning Chamber
AFBC	Atmospheric fluidized bed combustion
CARs	Corrective action requests
CDM	Clean Development Mechanism
CDM-EB	Executive Board of Clean Development Mechanism
CDM M&P	Modalities and procedures for a clean development Mechanism
CDM-MP	Methodologies Panel for Clean Development Mechanism
CEA	Central Electricity Authority
CER	Certified Emission Reduction
CLs	Clarifications
COP/MOP	Conference of the Parties serving as meeting of the Parties to the Kyoto Protocol
DRI	Direct Reduction Iron
DNA	Designated National Authority
EIA	Environmental impacts assessment
EF	Emission factor
EMS	Emissions Monitoring System
ESP	Electrostatic Precipitator
FBC	Fluidized Bed Combustion
GCV	Gross Calorific Value
GWh	Giga Watt Hour
GHG	Greenhouse gas
IPCC	Intergovernmental panel on climate change
KP	Kyoto Protocol of the United Nations Framework Convention on Climate Change
LoA	Letter of approval
LR	Lloyd's Register
LRQA	Lloyd's Register Quality Assurance Limited
MoEF	Ministry of Environment and Forests
MWh	Mega Watt Hour
NCV	Net Calorific Value
NCDMA	National Clean Development Mechanism Authority established in the Ministry of Environment and Forests (MoEF)
NGO	Non governmental organization
OH	Operating Hours
PDD	Project design document
PP	Project participant
PLF	Plant Load Factor
tCO <sub>2</sub> e	Tonne(s) of carbon dioxide equivalent
tpd/ TPD	tonne(s) per day
UNFCCC	United Nations Framework Convention on Climate Change
WHRB	Waste Heat Recovery Boiler
VVM	Clean Development Mechanism Validation and Verification manual

## 2 Introduction

Vision Sponge Iron Private Ltd. has contracted with Lloyd's Register Quality Assurance Limited (LRQA) to undertake validation of the proposed project activity Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India located at Purulia, West Bengal, India. This report summarises the findings identified through the validation process that has been conducted against the validation requirements of the CDM.

The validation has been undertaken by a team of qualified personnel of LRQA as follows.

Prabodha C Acharya	LRQA Ltd., India	Team Leader, CDM Lead Validator, Sector Expert
Shubha J Shanbhag	LRQA Ltd., India	Team Member, CDM Validator
Swaroop Banerjee	LRQA Ltd., India	Team Member, CDM Validator
Ketan S Deshmukh	LRQA Ltd., India	Technical Reviewer, CDM Lead Validator
A V Shivaramakrishnan	LRQA Ltd., India	Sector Expert to Technical Reviewer
Michiaki Chiba	LRQA Ltd.	Decision Maker

Personnel being engaged in a CDM project validation are qualified based on the established procedures of LRQA, to assure the resource requirements satisfy all the requirements of CDM Accreditation Standard for Operational Entities. LRQA is designated as an operational entity and holds the full responsibility of decision-making regarding the validation, in accordance with the accreditation requirements of the CDM-EB. The certificate of appointment of the team personnel is attached to this report.

### 2.1 Objective

Validation is the process of an independent third party evaluation of a project activity on the basis of the PDD, against the requirements of the CDM as set out in the Article 12 of the Kyoto Protocol, the CDM M&P, the present annex, subsequent decisions made by the COP/MOP and CDM-EB, other rules applicable to the proposed project activity, including the host country's legislation and its specific requirements for sustainable development.

### 2.2 Scope

The scope of validation is an independent and objective review of the project design. Review of the PDD is conducted against the requirements of the Kyoto Protocol, the CDM M&P, the relevant decisions of the COP/MOP and the CDM-EB. Validation is not meant to provide any consulting towards the PP, however, the corrective actions requests (CARs) and clarifications (CLs) might provide input for improvement of the project design. A validation conclusion shall become final, subject to the technical review and the decision maker's review by LRQA Ltd.

## 2.3 GHG Project Description

The project activity involves utilization of sensible heat content of the DRI Kiln waste gas for electricity generation. The project activity proposes to utilise the waste heat from the existing facility of 2 x 100tpd DRI and the proposed 3 x 100tpd DRI facility. The electricity would be generated using five Waste Heat Recovery Boilers (WHRBs) and 1 fluidized bed combustion (FBC) boiler feeding to a common turbine of 15MW capacity. In absence of the project activity, the equivalent amount of electricity would have been sourced from coal based captive power plant to meet the requirement of the iron and steel making facility. The project activity is being implemented to replace an equivalent amount of power generation from a carbon intensive coal based power plant and thereby reducing the Greenhouse Gas (GHG) emissions.

The project activity will result in emission reductions of 59,320 tonnes of CO<sub>2</sub>e per annum.

## 3 Methodology

### 3.1 Review of documents

The validation was performed primarily based on the review of the project design document (PDD), other supporting documentation and a site visit. On the basis of the review of the PDD version 01 dated 29.02.2008 and additional information that was requested from the PP, a site visit was conducted on 25<sup>th</sup>-26<sup>th</sup> August 2008. Several site related documents and the additional information that were requested were reviewed (listed under Appendix B of this report).

Based on the site visit and other evidence reviewed, a draft validation report containing Findings Log was issued. Subsequent submissions by the PP resulted in revisions to PDD, emission reduction spreadsheet and the investment comparison spreadsheet towards the resolution of findings raised by LRQA in its draft report. This document demonstrates the process of validation employed by LRQA.

Through the process of the validation, the PDD and the supporting documents were evaluated to confirm the actions taken by the PP to any CARs and CLs issued by LRQA. The documents reviewed by LRQA are listed in Appendix B.

### 3.2 Follow-up interviews

Follow-up interviews with stakeholders were conducted with the parties as detailed in the schedule as below.

25 <sup>th</sup> August 2008	Vision Sponge Iron Private Ltd, Purulia
25 <sup>th</sup> August 2008	Ernst & Young Private Limited, Purulia
25 <sup>th</sup> August 2008	Beliatora Gram Panchayat, Purulia
23 <sup>rd</sup> September 2008	Triveni Engineering & Industries Limited

A full list of persons interviewed is shown in the Appendix C.

### 3.3 Resolution of clarification and corrective action requests

Findings identified in the process are indicated under the titles Corrective Action Requests (CARs), Clarifications (CLs) and Forward Action Requests (FARs). CARs and CLs require the PP to take relevant actions. Criteria for judging items as CAR or CL are as follows:

Corrective Action Request (CAR):

- 1) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable, additional emission reductions;
- 2) The CDM requirements have not been met; or
- 3) There is a risk that emission reductions cannot be monitored or calculated.

Clarification (CL) Request:

- 1) Information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is to be raised to highlight issues related to project implementation that require review during the first verification of the project activity. FARs do not relate to CDM requirements for registration

The objective of this phase of the validation is to resolve CARs and CLs which need to be addressed for positive conclusion on the project design. The resolution of CARs and CLs raised by LRQA has been reflected in revised project documentation that has been submitted to LRQA for validation conclusion.

### 3.4 Internal quality control

The technical review by a qualified person independent from the validation team and a review by an authorized decision maker were conducted prior to the submission of the validation report and prior to requesting the registration of the project activity.

## 4 Validation Protocol and Conclusions

This section provides an overview of the validation activities undertaken by LRQA in order to arrive at the final validation conclusions and opinion. It includes a general discussion of details captured by the validation protocol (which is based on the Clean Development Mechanism Validation and Verification Manual version 01) and conclusions related to CDM requirements.

Further details in relation to specific findings are provided in the Validation Findings Log.

The protocol is structured based on the main validation requirements as follows:

- Participation requirements
- General description
- Baseline methodology
- Emission reductions

- Monitoring methodology and monitoring plan
- Duration of the project activity / crediting period
- Environmental impacts
- Stakeholders' comments

## 4.1 Participation requirements

A CDM project shall be approved by the Parties involved.

The host Party of the proposed project is India. India has ratified the Kyoto Protocol on 26 August 2002. The Designated National Authority is National Clean Development Mechanism Authority established in the Ministry of Environment and Forests (MoEF) (NCDMA). The information of the DNA of India had been confirmed by the validation team against the relevant information on the UNFCCC CDM website (<http://cdm.unfccc.int/DNA/index.html>).

LRQA received the letters of approval (LoAs) of this project from the project participant. The written approval (LoA) of the proposed project activity dated 4<sup>th</sup> August 2008 was issued by the host country Party's DNA. The contents of the LoAs were reviewed against the requirements for the elements of written approval and confirmed that a) the participation has been approved by a Party to the Kyoto Protocol, b) participation in the project activity is voluntary, c) the project activity contributes to the sustainable development of the host country (LoA of the host Party), d) the LoAs refer to the correct title of the project activity and are unconditional to the elements. Also the LoAs were compared with the other approval cases issued by the NCDMA as well as the information made public in the website at <http://cdmindia.nic.in/cdmindia/projectList.jsp?n=y&off=376> and the team confirmed authenticity of the letter issued.

The project has been proposed currently as a unilateral CDM project, which is in line with EB18 para 57 provision, registration of a project activity can take place without an Annex I party being involved at the stage of registration.

## 4.2 General description

The validation team checked and confirmed that the PDD follows the CDM- PDD Version 03.2 [EB25 Annex 15] and the Guidelines for Completing the Project Design Document (CDM-PDD) and the proposed new baseline and monitoring methodologies (CDM-NM) version 07 [EB41 Annex 12] referred henceforth as 'CDM-PDD Guidelines version 07' for simplicity. The Validation team reviewed the PDD and other evidence and confirmed the aspects below.

The project is located in the plant premises of Vision Sponge Iron Private Ltd (VSIPL) at Rakta in Madhukumda, in the Purulia district of West Bengal, India. The project entails utilization of the heat content of the DRI kiln gas for generation of electricity in a waste heat recovery based power plant. The power generated by the project activity will meet the electrical energy requirement of the manufacturing facility of VSIPL which includes the sponge iron plant and the steel melting shop.



The project activity is a steam based power plant which uses Rankine cycle system for transforming heat energy to mechanical energy at the turbine shaft. The project activity involves the installation of 5 numbers waste heat recovery boiler and a 15 MW steam turbo generator. The total steam requirement in the TG has been made available by WHRB and an AFBC through a common steam feeder. The steam generated in the WHRB is equivalent to 8.4 MW electricity generation and for AFBC it is equivalent to 6.6 MW.

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 followed by passing it through an Electrostatic Precipitator (ESP) prior to venting to the atmosphere.

In the project scenario, the waste gas from the DRI kiln, after complete combustion in the ABC, will be introduced into the Waste Heat Recovery Boiler (WHRB) where the heat content of the DRI kiln gas will be extracted and utilized for generation of steam. The waste gas released after recovery of useful energy from the turbine is passed through ESP prior to venting to the atmosphere. The technical details of the DRI kilns have been verified from specification of the technology supplier i.e Popurri Engineering Limited (Poppuri). Popurri is the technology supplier for the existing as well as new DRI kilns. The technical details of the WHRB and AFBC and have been verified from the technical specifications given by the Veasons Energy Systems Private Ltd. VSIPL is still in the process of finalising the equipment supplier for the waste heat recovery boiler and the AFBC. The steam turbo generator has been designed by Triveni Engineering & Industries Ltd.

The project activity will generate around 53.2224 GWh of net electrical energy per annum. 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 is estimated to reduce emission of 593,200 tonnes CO<sub>2</sub> of over the entire crediting period of 10 years.

The description in the PDD and the project design details were cross checked with the detailed project report (DPR), on site visit, technical drawings, equipment supply agreements, name plates and the official documents of the host Government and the relevance was confirmed by the validation team.

The project activity is expected to contribute to the sustainable development criteria of the host country by promoting sustainable economic and industrial growth in the long run, help conserving natural resources, and consequently contributing to a cleaner and healthier environment. Also the project will benefit to the local society by reducing pollution associated with the energy production and producing employment opportunity to the local people. The LoA issued by the host country's DNA confirmed that the project activity contributes to sustainable development of the host country

The following issues were raised by the validation team and addressed by the PP through the validation process.

**CAR1**

The project description presented in section A.2 of the PDD did not give a clear description of pre-project, project and baseline scenario as per the requirements of the CDM PDD Guidelines version 07 and hence CAR1 had to be raised during the course of validation. However the revised PDD version 03 dated 19<sup>th</sup> May 2009 clearly describes the project activity as required in the CDM/PDD guidelines and hence CAR1 was successfully closed.

**CAR2**

The technology to be employed at the project activity was not described in accordance with CDM PDD Guidelines version 07 and hence CAR2 had to be raised however section A.4.3 of the revised PDD version 03 has been modified to accommodate all changes as required in the CDM PDD guidelines version 07 and is now in compliance with guidance and also the changes in methodological approach and monitoring section to include the emissions due to other supplementary electricity consumption that may arise due to either from the DG set or from any import from grid has been reviewed by the validation team and found to be acceptable. CAR2 was therefore closed.

**CL1**

The capacity of the proposed project activity presented in the PDD was not consistent with the legal clearances obtained for the project and hence CL1 had to be raised. However PP clarified that although the environmental clearance was obtained for the total project capacity of 18 MW considering to have additional facilities like ferro-alloy and coal-washery, later which was not included in the DPR and therefore revised the power requirement to a lower capacity power plant of 15 MW. This is in compliance to the legal requirement of the host country. Extract of minutes of the meeting of the board of Directors of Vision Sponge Iron Private Limited dated 6<sup>th</sup> April 2007, Equipment supply contract with the Triveni Engineering and Industries Limited dated 1<sup>st</sup> October 2008 for 15 MW turbine and the letter of ARK Engineering and Letter from ARK Engineering and Consultancy to Vision Sponge Iron Private Limited giving the power requirements of the different facilities dated 13/04/2007 was reviewed by the validation team to confirm the project capacity of 15 MW and hence CL1 was closed.

**CL2**

Unique identification details for the project activity site were not available in the PDD and hence CL2 was raised. The PDD version 03 now includes the project site specific latitude and longitude, which was confirmed by the validation team from the Google earth and EIA/EMP study reports, hence CL2 was closed.

**CL3**

The technical specifications of the waste heat recovery boilers presented in the PDD were not consistent with legal authorisations (the consents from the pollution control boards) and the detailed project report for the project activity. Also the technical specifications of the turbine were not consistent with the detailed project report for the project activity and hence CL3 was raised. During the validation, the WHRB and AFBC were confirmed from the boiler manufacturer Veesons Energy Systems Private Limited vide letter dated 24.04.07

that the boiler specifications are in accordance to the specifications given by the boiler manufacturer and consistent with DPR. The specifications for the Turbo Generator were verified through the contract document with the Turbine Manufacturer (Triveni Engineering) dated 01 October 2008. The specifications of the WHRB, AFBC and TG are now consistent and corrected in the PDD version 03. CL3 was closed.

#### **CL5**

Although the PDD stated that no public funding would be used for the project activity the supporting evidence and the details of the project funding were not provided for validation and hence CL5 was raised. However the same was closed on the review of following documents

- 1) Self-declaration provided by PP, dated 20/10/2008 states hat no ODA/public funding is used for the project.
- 2) Minutes of the consortium meeting of the lending banks of Vision Sponge Iron Private Limited held on 24/10/2008
- 3) Letter from State Bank of Hyderabad dated 21/08/2008 to inform about the sanction of term loan to Vision Sponge Iron Private Limited
- 4) Letter from Punjab National Bank dated 18/06/2008 to inform about the sanction of term loan to Vision Sponge Iron Private Limited

Hence CL5 was closed based on the above evidence that the funding are based on equity and loan from banks.

### **4.3 Baseline methodology**

#### **Application of baseline and monitoring methodology**

The project applies the approved consolidated baseline and monitoring methodology ACM0012 / Version 3.1 –“Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects”, which is the current version effective from 16<sup>th</sup> August 2008. The period of the global stakeholders’ consultation process (GSP) for the project activity was held from 22<sup>nd</sup> July to 20<sup>th</sup> August 2008 and at the time of the commencement of the validation the Version 2.0 of ACM0012 was valid. Subsequently the project proponent seeks clarification on the application of the methodology to the project activity that was considered in the 38<sup>th</sup> MP (4 -8 May 2009) and EB47 (26-28 May 2009). Since the project activity applying ACM0012 version 2.0 was allowed for requesting registration until 15<sup>th</sup> April 23:59 GMT, the PP has applied the recent version of the methodology as per the procedure for processing and reporting on validation of CDM project activities. (EB43, Annex12).

The methodology refers to the latest version of “Tool to calculate the emission factor for an electricity system” and “Tool for the demonstration and assessment of additionality” (Additionality Tool). The current versions of the tools are Version 01.1 and Version 05.2 respectively.

The project applicability was confirmed against each condition in the approved methodology selected by the following methods.

The project is a type-1 project activity as per the methodology since all the waste energy from the existing (2 DRI) and new facility (3 DRI) would be used for generation of electricity, which is (or would have been for the new facilities) released to the atmosphere in absence of the project activity. This was confirmed from the on-site check conducted during the site visit in August 2008 that the waste gas from the existing DRI are being released to atmosphere. Further, the validation team confirmed during the site visit that there was no equipment for waste energy recovery and utilisation facility.

- Electricity generated in the project activity is based on waste energy not waste pressure
- Electricity generated to be used within the industrial facility, since total power requirement in the plant is higher than the electricity generation capacity of the project activity, which was confirmed from review of total power requirements of the plant
- The generated electricity is meant for captive purpose which was confirmed on basis of the DPR of the project activity.
- Energy is generated by the owner of the industrial facility, which was confirmed through the interview of the top management during the site visit and review of the equipment supply contract signed by VSPL (owner) for the turbine. It was also confirmed that the owner of the industrial facility is the same as the generator of the energy through legal titles of the kiln and the proposed captive power generation plant.
- In the host country, there is no regulation that constrains the industrial facility i.e VSPL to use fossil fuel. In fact, a fossil fuel based AFBC is also planned to be implemented along with the project activity. Appropriate legal permits for AFBC were sighted which clearly indicates that regulations do not constrain the plant from using fossil fuels.
- The project activity is a combination of new and existing facility. Earlier to the project activity, there was no facility of power generation in the plant premises, when the 2x100tpd DRI Kilns (existing facility) were operational. The 3 new 100tpd DRI kilns (new facility) are planned as part of expansion plan of the iron & steel making facility. A clarification was requested from EB to confirm whether the methodology allows a combination of new and existing facility within a single PDD. The request was considered in the 38th MP (4 -8 May 2009) and EB47 (26-28 May 2009). Refer AM\_CLA\_0141 through the following link wherein the Meth Panel recommended that the PP submit a single PDD containing the existing kilns and new kilns. .  
[http://cdm.unfccc.int/UserManagement/FileStorage/AM\\_CLAR\\_YFF2OCX2PWGCYS7YE4XEEQSDTFARMP](http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_YFF2OCX2PWGCYS7YE4XEEQSDTFARMP)
- The emission reductions from the project activity would be claimed by the generator of the electrical energy using waste energy of DRI i.e Vision Sponge Iron Private Limited who is also the owner of the industrial facility producing the waste energy.
- Energy is not exported to other facilities. Energy is used by Vision Sponge Iron Private Limited which is the owner of the industrial facility that produces waste energy, the generator of energy and the user of the energy. As such, agreement between the generator and recipient is not deemed necessary.
- Since the lifetime of the Kilns was confirmed from the equipment supplier to be 25 years, the residual life of Kiln-1 that was commissioned in the year

2003 is 19 years and that of Kiln-2 that was commissioned during 2006 having residual life of 22 years, which is larger than the ten year fixed crediting period being sought by the PP for claiming the Emission Reduction credits.

- Waste gas that is released under abnormal operation (emergencies, shut down) of the plant shall not be accounted for since the project proponent will not consider waste gas that will be released under abnormal operation (emergencies, shut down) of the plant for estimation of emission reductions.

The waste energy (i.e the sensible heat from the DRI waste gas) utilized in the project activity was released into the atmosphere in the absence of the project activity. This has been verified from the electricity bills of the plant which establishes that there was no electricity generation in the plant and the entire electricity requirement was sourced from the grid. The electricity bills as required were audited by competent authorities.

### **Project Boundary**

The physical boundary of the project activity covers.

1. The industrial facility where waste energy is generated i.e all five DRI kilns of VSIPL along with the ducting system for transportation of waste gas from the ABC outlet to each of the Waste Heat Recovery Boilers (WHRB) in the power plant;
2. The facility where process heat in the element process (steam) is generated i.e the power plant equipments (both WHRB and AFBC) where the heat content of the waste energy will be utilized for generation of steam and subsequently power. This will also include the auxiliary equipments of the power plant; and
3. The facility where the electrical energy is used i.e the steel melting shop, DRI kilns and other equipments of the plant of VSIPL where the electricity will be consumed.

The project boundary has been validated through documentation review of detailed project report, evidences from the consultants appointed for design of kilns, waste heat recovery systems and power plant and interaction with employees and personnel having project knowledge as interviewed during the site visit to confirm the project boundary. During the site visit it was noted that only the two existing kilns were operating and the construction work for two additional kilns out of three had been started.

The identified boundary and the selected sources and gases are justified for the project activity in the PDD.

The following issues were raised by the validation team and addressed by the PP through the validation process.

**CAR3**

The PDD did not mention about how the waste gas released under the abnormalities would be accounted for. The monitoring point and procedures were clarified for waste gas in the revised PDD. The PP further clarified that release of waste gas under abnormalities would also occur in the baseline scenario however the PP would monitor the supplementary fossil fuel consumption and electricity consumption used in case of any exigencies and account the same under project emissions as per revised PDD Version 03. The same is deemed appropriate and hence CAR3 was closed.

**CL6**

To demonstrate that the waste energy utilized in the project activity was released into the atmosphere, PP had mentioned the use of "Energy balance of the relevant sections of the plant". However the same was not made available for validation and hence CL6 was raised. The section B.2 has been revised in the PDD version 03 to include Energy bills (electricity, fossil fuel) to demonstrate that all the energy required for the process has been procured commercially. The energy bills were audited by the competent authorities as required by the methodology and which confirmed that prior to the project activity all waste gas generated was released to the atmosphere and not utilized/captured. The same was also confirmed during the site visit by the validation team.

**CL7**

The PDD section B.2 stated that "all equipments to be installed under the project activity will be newly procured and will have lifetime exceeding 15years." However the supporting for the same was not provided and hence CL7 was raised. The same was successfully closed after review of the letters from the equipment supplier and the consultants appointed for the project activity which certified that the minimum operational lifetime of the kilns, WHRB and the turbine is 25 years.

**CL8**

The emissions sources and gases included in the project boundary and the monitoring variables were not clearly presented in the project boundary diagram. The PDD version 03 has modified project boundary diagram including all the emission sources and monitoring variables. CL8 was closed.

**Baseline scenario**

As per ACM0012/ Version 3.1, Baseline scenario needs to be arrived in following Steps

**Step 1:** Define the most plausible baseline scenario for the generation of heat and electricity using the baseline options and combinations as prescribed in the approved methodology.

The baseline has been identified separately for the existing facility of 2 DRI Kilns and the new facility i.e new 3 DRI Kilns. This is in line with the MP clarification AM\_CLA\_0141 that states "The procedure for baseline scenario determination

shall consider the baseline scenarios for each of the components, existing kilns and new kilns, which may not be the same”.

For the existing 2 DRI Kilns, the realistic and credible baseline alternatives for the use of waste energy is determined as

Baseline Alternatives	Waste Energy	Description of the alternative
1	W2	WECM is released to the atmosphere i.e. Waste gas generated from the DRI Kilns would have been flared and the heat energy content of the waste gas would have been wasted.

For the new 3 DRI Kilns, the realistic and credible baseline alternatives for the use of waste energy includes

Baseline Alternatives	Waste Energy	Description of the alternative
1	W2	WECM is released to the atmosphere i.e. Waste gas generated from the DRI Kilns would have been flared and the heat energy content of the waste gas would have been wasted.

The plausible baseline alternative for the use of waste energy for the existing as well new facility would be W2 as given in the above table.

For power generation, the realistic and credible alternatives have been analyzed for the total power requirement of the manufacturing facility of VSIPL which involves expansion of sponge iron plant and steel melting shop.

Baseline Alternatives	Power	Description of the alternative
1	P4	Power equivalent to that generated in the project activity would have been generated in fossil fuel fired captive power plant.
2	P6	Power equivalent to that generated in the project activity would have been at power plants connected to the grid.

The justification for elimination of other alternatives for use of waste energy and power generation is provided in detail in Appendix G of the report.



Based on the baseline options and combinations prescribed in the approved methodology the following is arrived as most plausible baseline scenarios.

Baseline Alternatives	Waste Energy	Power	Description of the alternative
1	W2	P4	Waste gas generated from the DRI Kilns would have been flared and the heat energy content of the waste gas would have been wasted. Power equivalent to that generated in the project activity would have been generated in fossil fuel fired captive power plant.
2		P6	Waste gas generated from the DRI Kilns would have been flared and the heat energy content of the waste gas would have been wasted. Power equivalent to that generated in the project activity would have been generated at power plants connected to the grid.

Alternatives for steam/heat generation and mechanical energy generation in absence of the project activity have not been considered since the project activity will not involve any generation of steam/heat and mechanical energy.

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

Coal is identified as the baseline fuel and its availability in the host country and region where the project activity is located is confirmed through

- <http://www.mapsofindia.com/maps/minerals/coal-mines-map.html>
- <http://www.mapsofworld.com/business/industries/coal-energy/india-coal-deposits.html>
- <http://www.mapsofindia.com/maps/westbengal/westbengal-district-map.gif>

The map clearly shows the locations Ranigunj, Jharia and Bokaro to be very close to the project site. Hence there is no supply constraint for the identified baseline fuel i.e. coal. However coal fines and chars is used as fuel mix for the baseline fossil fuel based power plant. And the availability of coal fines and char is confirmed through the review of the detailed project report. The DPR confirms that coal fines and char is generated in ample quantity within plant and there is no supply constraint for the same.

Power plant utilizing 100% coal also could have been the baseline alternative, but the coal fines & char combined fuel would have lesser carbon emission factor than of coal. Also the 100% coal based power plant would not be a realistic scenario since the coal fines and char are generated within the plant and non-utilization of the same would have led to monetary losses for the project participant and hence cannot be considered as the realistic and plausible option.



Diesel as a baseline fuel was analyzed and its availability in host country is confirmed through the review of Report of The Expert Committee on Fuels for power generation published by Government of India, Central Electricity Authority in February 2004<sup>1</sup>. The expert committee report clearly states that the diesel based power generation is most expensive (7.48 INR/kWh). Also step 3 of the methodology stipulates elimination of non-feasible options or which are clearly economically unattractive and hence diesel based power generation cannot be considered as a realistic and credible baseline scenario.

Natural gas as a baseline fuel is also analyzed and it was found that natural gas pipeline is not available in the eastern region of the country and the same is confirmed through the following websites

1. <http://petroleum.nic.in/ng.htm>
2. <http://www.mapsofindia.com/maps/oilandgasmaps/gaspipelines.htm>

And because there is supply constraint for the natural gas, natural gas based power generation was not considered as the plausible baseline.

Thus determination of the step concluded that mixture of coal fines and char being generated from in-house DRI process is only plausible baseline choice for energy source.

**STEP 3:** Step 2 and/or step 3 of the latest approved version of the “Tool for the demonstration and assessment of additionality” shall be used.

As per the approved version of the “Tool for the demonstration and assessment of additionality” the (Step 2) investment analysis is carried out for the identified alternatives.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

The project activity and the alternative identified generate financial benefits other than CDM related income and hence simple cost analysis is not applied.

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

The feasible baseline alternative is identified in terms of levelized cost of electricity production in INR/kWh.

The key assumptions and critical parameters adopted to arrive at the levelized cost of power generation have been cross verified from the following documents/websites-

Sr.No	Parameter	Value used	Means of validation
1.	Power generation capacity	15 MW	The same is cross verified from the confirmation of the project consultant (ARK Engineering and Services) and the Equipment Supply Contract with Triveni Engineering & Industries Ltd.

<sup>1</sup>

[http://www.cea.nic.in/thermal/Special\\_reports/Report%20of%20the%20expert%20committee%20on%20fuels%20for%20power%20generation.pdf](http://www.cea.nic.in/thermal/Special_reports/Report%20of%20the%20expert%20committee%20on%20fuels%20for%20power%20generation.pdf)

Sr.No	Parameter	Value used	Means of validation
2.	Auxiliary consumption	10%	<p>As per the details of the project engineering consultant (ARK Engineering and Consultancy) suggesting two project options to M/s Vision Sponge Iron Private Limited to cater their power requirements dated 24/04/2007</p> <p>Cross verified with the CEA database version 04<sup>2</sup> and found that auxiliary consumption for the coal based power plants for which data is not available is 8% and for units considered in Build Margin with capacity of 67.5 MW the same is considered as 12%. The value considered is within the acceptable range and considered appropriate.</p> <p>Review of similar projects also confirms that the 10% auxiliary consumption for coal based power plants is appropriate.</p>
3.	Plant load factor	90.4%	The value is derived assuming 330 days of operation, which was confirmed from the sector knowledge and review of similar registered projects and achieved PLF of the coal based private sector power plants ( details referred in CEA data base version 04 and thermal power plant performance review in India, 2007-08) <sup>3, 4</sup>
4.	Design Station heat rate	3071 kcal/kwh	Calculated value assuming plant efficiency of 28%, highest value given by different manufacturers. The efficiency value has also been cross verified with CEA database version 04 <sup>5</sup> which specifies the net efficiency value of 28% for units considered in Build Margin with capacity of 67.5 MW.
5.	Quantity of coal in fuel mix	38%	The value is specified by the power plant consultant. The same is cross verified from the Letter from ARK Engineering and Consultancy suggesting two project options to M/s Vision Sponge Iron Private Limited to cater their power requirements dated 24/04/2007
6.	Quantity of char in fuel mix	62%	
7.	Net calorific value of coal	4491 Kcal/kg	<p>The net calorific values are calculated using the IPCC formula<sup>6</sup></p> $NetCV = GrossCV - 0.212H - 0.0245M - 0.008Y$

<sup>2</sup> [http://www.cea.nic.in/planning/c%20and%20e/database\\_publishing\\_ver4.zip](http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver4.zip)

<sup>3</sup> [http://www.cea.nic.in/god/opm/Thermal\\_Performance\\_Review/0708/highlights.pdf](http://www.cea.nic.in/god/opm/Thermal_Performance_Review/0708/highlights.pdf);

<sup>4</sup> [http://www.cea.nic.in/god/opm/Thermal\\_Performance\\_Review/0708Final/0\\_Coverpage.pdf](http://www.cea.nic.in/god/opm/Thermal_Performance_Review/0708Final/0_Coverpage.pdf)

<sup>5</sup> [http://www.cea.nic.in/planning/c%20and%20e/database\\_publishing\\_ver4.zip](http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver4.zip)

Sr.No	Parameter	Value used	Means of validation
8.	Net calorific value of char	1995 kcal/kg	Wherein the H-Hydrogen ,M- Moisture, Y-Ash  The percentage of Hydrogen, Moisture and ash content are taken from ultimate fuel analysis provided in the detailed project report.  The values were also compared with the chemical analysis certificates provided by Mitra S.K.Private Limited (Refer Appendix B)
9.	coal cost	1000 Rs/MT	The price is cross verified from the historical sales of coal fines. Ledger account for the period 1 <sup>st</sup> April 2006 to 31 <sup>st</sup> March 2007 of VSIPL was reviewed to confirm the same.
10.	salaries	13,860,000 Rs/annum	Cross verified from letter from ARK Engineering and Consultancy giving the O&M expenses for the power plant operation dated 28/04/2007
11.	maintenance charges, INR	13,821,225	Cross verified from the letter from ARK Engineering and Consultancy giving the O&M expenses for the power plant operation dated 28/04/2007  Calculated assuming 2.5% of the total project cost and the same is deemed appropriate and also in line with the CERC notification dated 26 <sup>th</sup> March 2001
12.	depreciation rates for building, plant and machinery	3.24% for buildings 5.28% for plant and machinery	The depreciation values has been taken as per SCHEDULE XIV, Companies Act and cross verified from the website <sup>7</sup>
13.	total project cost , INR	552,849,000	Estimation provided by the engineering consultant (ARK Engineering) in the cost estimate of the baseline and project options dated 27/04/2007  The total project cost is compared with capital cost of project for the coal based power plant which estimated to be is 40million INR/MW as specified in "Report of the Expert Committee on

<sup>6</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2\\_Volume2/V2\\_1\\_Ch1\\_Introduction.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf) (Box 1.1, Page 1.17)

<sup>7</sup> [http://www.mca.gov.in/MinistryWebsite/dca/actsbills/pdf/Companies\\_Act\\_1956\\_Part\\_2.pdf](http://www.mca.gov.in/MinistryWebsite/dca/actsbills/pdf/Companies_Act_1956_Part_2.pdf)

<sup>8</sup> [http://www.cea.nic.in/thermal/Special\\_reports/Report%20of%20the%20expert%20committee%20on%20fuel%20for%20power%20generation.pdf](http://www.cea.nic.in/thermal/Special_reports/Report%20of%20the%20expert%20committee%20on%20fuel%20for%20power%20generation.pdf)

Sr.No	Parameter	Value used	Means of validation
			fuels for power generation” published by Central Electricity Authority <sup>8</sup> and found to be conservative.
14.	rate of interest	12.25%	The Interest rate is the prime lending rate as given by the RBI <sup>9</sup> .

#### Sub-step 2C: Calculation and comparison of financial indicators

Sr.No	Parameter	Value used	Means of validation
1.	Generation cost (coal based captive power plant)	1.78 INR/KWh	The input values used for the levelized cost computations have been validated as presented in the above table and the same are deemed appropriate.
2.	Generation cost (Import of power from Grid)	4.90 INR/Kwh	<p>The value chosen is derived by applying a discount factor of 12.25% basic value of electricity import from grid which is 3.10 INR/KWh. The value is taken as average of the power purchase cost for the period October 2005 to June 2009. The same is cross verified from following sources.</p> <ol style="list-style-type: none"> <li>1) Energy Bills for the imported power from Damodar valley Corporation for the period 17<sup>th</sup> November 2005 to 15<sup>th</sup> July 2008</li> <li>2) Certificate of the chartered accountant, RSPM &amp; CO certifying the electricity bill statements for the period October 2005 to June 2008 dated 5<sup>th</sup> June 2009</li> </ol> <p>The value considered is deemed appropriate.</p>

This indicates that the generation cost of power from the coal based power plant using coal fines and char being produced at the project DRI plants is most economically attractive and hence the baseline.

**STEP 4:** If more than one credible and plausible alternative scenario remains, the alternative with the lowest baseline emissions shall be considered as the most likely baseline scenario.

<sup>9</sup> <http://rbi.org.in/>

As only one credible and plausible alternative scenario is remaining after the step 3, the Generation of equivalent power in a coal based captive power plant (that uses coal fines and Char as available at the facility) is rightly identified as the baseline for the project activity.

#### **CAR4**

PP had not provided any evidence to support the statement “the waste gas is required to be combusted completely” is a legal requirement as claimed in elimination of alternative W1 as possible baseline and hence CAR4 was raised. However the same was closed after reviewing the Comprehensive Industry document series on Sponge Iron Industry published by Central Pollution Control Board, Ministry of Environment and Forests in March 2007<sup>10</sup> which clearly states that “The hot DRI gases contains huge amount of fine dust comprising oxides and unburnt carbon and toxic carbon monoxide. It needs treatment before discharging into the atmosphere.” The same was confirmed by the validation team through review of GSR notification 414E published by ministry of environment and forest, dated 30<sup>th</sup> May 2008 (which was applicable at the time of completion of baseline study<sup>11</sup>). Hence CAR4 was closed.

#### **CAR5**

Key assumptions and rationales used for identification of baseline scenario were not described in the PDD. And hence CAR5 had to be raised. However the revised PDD version 03 clearly describes all the assumptions and rationales for identification of baseline and also provides the necessary references wherever necessary. And hence CAR5 was closed.

#### **CAR7**

The project proponent had included the grid component in the unit cost analysis for the baseline and project case. But since the base line is coal based power plant and the project activity is waste heat power generation, justification for inclusion of grid in the unit cost comparison analysis was required and hence CAR7 was raised.

As a response to the corrective action request, the project participant has presented the levelised cost of electricity generation as the financial indicator for the investment comparison analysis and has provided the revised levelized cost analysis computation spreadsheets considering coal based power plant and grid in the baseline and AFBC, WHRB and grid in the project case. PP further clarified that during assessing the viability of the project, all the options which can meet their total power requirement of the manufacturing facility were considered. Import from grid remains the source of electricity for the baseline and project case and hence the same was considered in the levelized cost analysis. This was cross verified with power purchase agreement for 3 MW with the Damodar Valley Corporation dated 5<sup>th</sup> October 2005 valid for 5 years which confirms that power was being sourced from the grid in the pre-project scenario and will continue to be source for meeting partial electricity demand. And hence inclusion of grid in the Levelized cost computations of baseline and project case is deemed appropriate. CAR7 was closed.

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<sup>10</sup> [http://www.cpcb.nic.in/upload/NewItems/NewItem\\_102\\_SPONGE\\_IRON.pdf](http://www.cpcb.nic.in/upload/NewItems/NewItem_102_SPONGE_IRON.pdf)

<sup>11</sup> <http://www.envfor.nic.in/legis/ep/414E.pdf>

**CL9**

PDD section B.4 did not clearly mention about which renewable resources were considered in the baseline option P5 and also evidence to justify the statement that “such resources have limited availability around the project site” was not provided for validation and hence CL9 had to be raised.

The PP clarified that the different renewable energy sources that were considered under baseline option P5 were Hydro, Biomass, and Wind etc. Out of these three, the availability of wind and biomass is very limited in the state of West Bengal. References have been provided in the PDD. Moreover as renewable resource (hydro) based power generating stations are typically used for peak load services and not for base load services which are important for sponge iron manufacturing the same was not considered for determination of baseline alternative. The justification provided is deemed appropriate and CL9 was closed.

**CL10**

Input values assumed in the unit cost analysis were not adequately substantiated and basis of their assumption and the supporting evidence wherever necessary was not detailed in the PDD and hence CL10 was requested. As a response to the clarification request, the project participant has provided the levelized cost of electricity generation as the financial indicator for the investment comparison analysis and has provided the revised levelized cost analysis computation spreadsheets and also provided the supporting evidences for the input values assumed and the same were validated and hence CL10 was closed.

**CL13**

Contact information of the person(s)/entity(ies) responsible for the application of the baseline and monitoring methodology to the project activity was not provided in the PDD section B.8 and neither it was clear whether the same person is the project participant as listed in Annex 1 and hence CL13 had to be raised. However the same was successfully closed on review of revised PDD version 03 which clearly indicates that the entity listed in B.8 is the project participant and the contact information is presented in Annex I and hence CL13 is closed.

Through the validation process LRQA have confirmed that:

- All the assumptions and data used by the project participants are listed in the PDD, including their references and sources;
- All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD;
- Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable;
- Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD;
- The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

The selected methodology is therefore considered applicable to the proposed CDM project activity

### **Additionality**

The project additionality was demonstrated by the PP using the tool for the demonstration and assessment of additionality Version 5.2

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

**Sub-step 1a – Define alternatives to the project activity-** All the plausible alternatives for waste gas utilization and power generation which are in compliance with the current laws and regulations have been dealt in details in the previous section and Appendix G to the validation report. The two alternatives available with the project proponent are as below:

- 1) Generation of equivalent power in a coal based captive power plant
- 2) Project activity

LRQA considers that the alternatives that have been considered are complete.

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

Both the alternatives are complying with all local laws and regulations.

### **Step 2. Investment Analysis**

Sub-step 2a: Determine appropriate analysis method

The project activity and the alternative identified generate financial benefits other than CDM related income and hence simple cost analysis is not applied.

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

As per this tool, the project proponent is required to "Identify the financial indicator, such as IRR, NPV, cost benefit ration, or unit cost of service (e.g., levelised cost of electricity production in \$/kWh or levelised cost of delivered heat in \$/GJ) most suitable for the project type and decision –making context." The feasible baseline alternative is identified in terms of levelized cost of electricity production in INR/kWh.

The key assumptions and critical parameters adopted to arrive at the levelized cost of power generation from coal based power plant are dealt in the baseline section and the same are applicable here. Whereas the assumptions for project activity are detailed below: -

Sr. No.	Parameter	AFBC- 6.6 MW	WHRB- 8.4 MW	Means of validation
1	Steam generation Capacity	32TPH	38 TPH <sup>12</sup>	The same is cross verified from the Engineering consultant of the project (ARK Engineering and Services) and the Equipment Supply Contract with Triveni Engineering & Industries Ltd
2	Auxiliary consumption	12%		As per CEA data <sup>13</sup> the auxiliary consumption for coal and lignite varies from 7.5 to 12%. The equipment supplier based on the load demand for each of the equipments has provided the auxiliary consumption for these equipments. Higher value of auxiliary consumption assumed in project case in comparison with base case is found appropriate as this involves installation of 5 WHRBs against 1 AFBC in the base case. This has also been confirmed from the similar project cases and found to be acceptable as there are no separate guidelines available by ERC or CEA on WHR based projects.
3	Plant Load Factor	90.4%	82%	The plant load factor for the coal based power plant is derived assuming 330 days of operation, as discussed in the baseline section. The PLF of WHR was validated based on the technology supplier information and is linked to the capacity utilization factor (CUF) of the DRI. The CUF for all DRI together is arrived at 66%, which was compared with the historic CUF that is calculated to be 51.4% during Oct 2006 to Dec 2008. Since, the technology supplier data and also the historic data of CUF is less than 82%, the same has been deemed to be suitable and conservative.

<sup>12</sup> The steam generation capacity is arrived based on the operation of 4 number of 9.5TPH WHRB at all the time.

<sup>13</sup> [http://www.cea.nic.in/planning/c%20and%20e/database\\_publishing\\_ver4.zip](http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver4.zip)



Sr. No.	Parameter	AFBC- 6.6 MW	WHRB- 8.4 MW	Means of validation
4	Design Station Heat Rate	3071		Calculated value assuming plant efficiency of 28%, highest value given the manufacturer. The efficiency value has also been cross verified with CEA database version 04 which specifies the net efficiency value of 28% for units considered in Build Margin with capacity of 67.5 MW.
5	Quantity of Coal in the fuel mix (Coal-Char mix)	38%		The value is specified by the power plant consultant. The same is cross verified from the details provided by the ARK Engineering and Consultancy suggesting two project options to M/s Vision Sponge Iron Private Limited to cater their power requirements dated 24/04/2007
6	Quantity of Char in the fuel mix (Coal-Char mix)	62%		
7	Net Calorific Value of Coal	4491 kcal/kg		The net calorific values are calculated using the IPCC formula
8	Net Calorific Value of Char	1995 kcal/kg		$NetCV = GrossCV - 0.212H - 0.0245M - 0.008Y$ <p>Wherein the H-Hydrogen ,M-Moisture, Y-Ash</p> <p>The percentage of Hydrogen, Moisture and ash content are taken from ultimate fuel analysis provided in the detailed project report.</p> <p>The values were also compared with the chemical analysis certificates provided by Mitra S.K.Private Limited (Refer Appendix B)</p>
9	Coal Cost, INR/MT	1000		The price is cross verified from the historical sales of coal fines. Ledger account for the period 1 <sup>st</sup> April 2006 to 31 <sup>st</sup> March 2007 of VSIPL was reviewed to confirm the same.
10	Salaries , INR/annum	4,060,000	20,300,000	Cross verified from the details provided by ARK Engineering and Consultancy giving the O&M expenses for the power plant operation dated 28/04/2007

Sr. No.	Parameter	AFBC- 6.6 MW	WHRB- 8.4 MW	Means of validation
				The higher cost of manpower assumed in the WHRB case is due to the technical problems occurring in the waste heat recovery based power plants, the need for highly experienced and more skilled manpower and the installation of 5 WHRBs against 1 AFBC as in base case.
11	Maintenance Charges INR/annum	9,257,500	14,337,750	Calculated assuming 3.5% of the total project cost. Cross verified from details provided by ARK Engineering and Consultancy giving the O&M expenses for the power plant operation dated 28/04/2007 and the same is deemed appropriate as confirmed from the similar projects.
12	Building, Plant & Machineries , INR/annum	10,714,484	17,068,172	The depreciation values has been taken as per SCHEDULE XIV, Companies Act <sup>14</sup>
13	Total Project Cost, INR	267,900,000	406,250,000	<p>Details provided by ARK Engineering consultancy giving the cost estimate of the baseline and project options dated 27/04/2007</p> <p>The validation of the project cost in baseline is detailed above.</p> <p>The cost of HRSG power generation in the gas based power plant is approximately INR47.2million per MW in Indian scenario<sup>15</sup>. The project cost is compared with similar project activities and found to be in acceptable range. Literature survey confirms the higher cost per kWh generation through waste energy<sup>16</sup></p>

<sup>14</sup> [http://www.mca.gov.in/MinistryWebsite/dca/actsbills/pdf/Companies\\_Act\\_1956\\_Part\\_2.pdf](http://www.mca.gov.in/MinistryWebsite/dca/actsbills/pdf/Companies_Act_1956_Part_2.pdf)

<sup>15</sup> [http://www.cea.nic.in/thermal/project\\_monitoring/BS%20ASSAM.pdf](http://www.cea.nic.in/thermal/project_monitoring/BS%20ASSAM.pdf)

<sup>16</sup> <http://www.chpcenterpr.org/wasteheat2power07/PDF/stinger%20presentation.pdf>

Sr. No.	Parameter	AFBC- 6.6 MW	WHRB- 8.4 MW	Means of validation
14	Rate of Interest	12.25%	12.25%	The interest rate considered was applicable at the time of investment decision. The Interest rate is the prime lending rate as given by the RBI <sup>17</sup> .

The DPR for the project activity was made during January 2007 and subsequently the engineering consultant engaged for the DPR has provided the detailed cost estimate on 27.04.2007, based on which the board took decision on 3<sup>rd</sup> May 2007 for the implementation of the project activity. The PP had informed that the investment decision was made based on the unit cost analysis that is presented in the investment analysis spread sheet. However, a levelised power cost analysis was made during the validation to capture the fluctuations in prices of the basic parameters required for unit cost computation over a reasonable period of time. The validation team has found that values used in the PDD and associated annexes are consistent with the values of DPR, project cost estimate and the technical description of the equipments. A levelized cost analysis has been done based on these input parameters. Cross-checking was conducted by the validation team and found that in the context of the project activity the input values are conservative and reasonable as discussed above. The details of the data sources and the calculation of the levelized cost analysis of unit power are presented in the calculation spreadsheet. The validation team assessed the calculation and supporting evidence and confirmed that the calculation is correct and meets the requirements of the Guidance on the Assessment of Investment Analysis (Annex to Tool for the demonstration and assessment of additionality). The calculation results show that the levelized cost of power generation in a coal based captive power plant using coal fines and char available at the project site *i.e.* baseline scenario is Rs 1.78/kWh and for the project scenario is Rs 2.03/kWh. Therefore, the proposed project is not considered financially feasible to the investors if it is not implemented as a CDM project activity.

#### **Sub-step 2d) Sensitivity analysis:**

The PP conducted the sensitivity analysis based on the following variables that affect the result of IRR analysis that are

- 1) Coal price
- 2) Grid power purchase cost
- 3) Plant load factor
- 4) Initial investment cost
- 5) Annual O&M cost

The choice of variables and range of variations meet the Guidance on the Assessment of Investment Analysis. The validation team assessed the reliability and robustness of the analysis and found that the levelized cost of electricity

<sup>17</sup> <http://rbi.org.in/>

production remains commercially unattractive with reasonable variation in critical assumptions. The results of the sensitivity analysis therefore confirm that the project is not economically viable.

#### CL11

No justification on parameters selected for sensitivity analysis was available in the PDD and also clarification on why PLF variation of +/- 5% was considered was required. Also clarification on why O&M cost was not considered for sensitivity analysis was required and hence CL11 had to be raised.

In response to this a revised sensitive analysis was performed considering a 10% variation in critical parameters. Variables like coal price, grid power purchase cost, the plant load factor, initial investment cost and the annual O&M cost which constitute more than 20% of total project cost /project revenues were subjected to reasonable variation. The same was reviewed by validation team for the correctness of input values and for the range of variations selected and found to be done appropriately. The levelized cost of electricity equals in both base case and project cases in following conditions:

- If the coal price increases by 75%, which is unlikely the case since the pricing of coal being mostly controlled in the host country.
- If the electricity tariff decrease by 82%, which is again unlikely since the unit cost of grid electricity always is in increases trend in past in the host country.
- If the Investment cost decreases by 68% & annual O&M cost decreases by 66%, which are unlikely with the inflation in the host country.
- If the PLF is increased by 12% for the WHRB, the levelized cost of both base case and project activity becomes 1.78 INR/kWh. This is unlikely to happen since the capacity utilisation of the existing DRI was 41% & 62% achieved during 2007 and 2008 respectively. Besides, since both AFBC and WHRB are common to a single generator, the maximum PLF that can be achieved for the type of the turbine (extraction cum condenser) would be 92% as per the technology supplier.

The validation team confirmed the relevance of the investment analysis including the sensitivity analysis that consistently supports the result of the investment analysis. Thus the CL11 was closed out.

#### Step 3. Barrier Analysis

The barriers presented in the PDD are mainly related to following

- Increase in raw material prices of the sponge iron industry
- Impact on production of the steel melting shop due to fluctuations in power generation from project activity (which is due to technical problems in kiln operations and waste gas generation from kilns )

The above mentioned barriers were validated as below

- The impact of increase in raw material prices of sponge iron industry was confirmed through the review of website (<http://news.oneindia.in/2006/11/07/bengals-sponge-iron-industry-in-crisis-1162905455.html>). The supporting website reference clearly indicates that the sponge iron industry in West Bengal has been suffering from operational loss

due to higher input costs. The impact of hike in raw material prices has also been seen in other nearby states of India (for e.g. Chattisgarh, Jharkhand, [http://www.thaindian.com/newsportal/business/chhattisgarh-sponge-iron-units-facing-closure\\_100114538.html](http://www.thaindian.com/newsportal/business/chhattisgarh-sponge-iron-units-facing-closure_100114538.html)) Hence it can be concluded that the mounting cost of basic inputs which are of prime importance are posing a barrier to operation of sponge iron industry in India.

- The PDD states that the use of coal with low ash fusion temperatures is used accretions are formed which will necessitate kiln shutdowns to removal of the same. The same was confirmed by the validation team through review of <http://www.steelworld.com/coalcri.htm>. The website reference also indicates that for a rotary kiln coal based sponge iron manufacturing process to be successful it is absolutely essential to use non-coking coals having high reactivity characteristics and high ash fusion temperatures. Unfortunately, most Indian non-coking coals do not satisfy the above criteria and are, therefore, not suitable for sponge iron manufacturing. Validation team confirms that the sponge iron operations are highly impacted due to this which in turn affects the waste gas generation and thereby the project activity.

Though the barriers presented in the PDD are considered real, the validation team concluded that the the identified barriers mainly relate to the operation of sponge iron industry and hence cannot be considered as a significant barrier in implementation of the proposed project activity. The additionality of the project activity is validated based on the "Investment Analysis".

#### **Step 4. Common practice analysis**

For assessing the common practice analysis, the sponge iron plants in the state of West Bengal has been considered. India being a large country, the government policies, subsidies, benefits, power and raw material costs, industrial and environmental policies are controlled and decided by the state authorities. Hence, considering the sponge iron plants in West Bengal for the common practice analysis is deemed justified.

As per the West Bengal Sponge Iron Manufacturers Association, there are total 42 sponge iron units in West Bengal. And among those, 27 units are not installed with WHRB. 15 units which have waste heat based power generation facilities installed have already entered into the CDM cycle but as per the step 4a of the additionality tool version 5.2, other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis and hence excluded in the common practice analysis. The list of sponge iron plants entering the CDM cycle has been reviewed by the validation team.

The Status of Pollution Mitigation Measures in Sponge Iron Plants as published in report on "Sponge Iron Industry", published by Central Pollution Control Board, Ministry of Environment & Forests, Government of India published during March 2007 indicates that out of the 32 sponge iron plants selected for the study from the states of West Bengal, Chattisgarh and Orissa only 2 plants in Orissa and 6 in Chattisgarh and none in West Bengal are equipped with the WHRB.

Further during the validation it was pointed out that since the project activity is coming up in a facility which would have down stream steel making process, similar facilities should be compared. Out of the 27 sponge iron plants in West Bengal, 12 plants are having downstream steel/steel ingot making facilities requiring higher power demand. But none of these 12 plants are having any Waste Heat Recovery based power plant. Detailed analysis of the same has been provided in the PDD. Hence it can be concluded that WHRB based power generation is not a common practice in sponge iron plants in West Bengal and WHRB in sponge iron plant in West Bengal is feasible only with CDM benefit.

From the discussion above it can be concluded that the project is not a business-as-usual scenario and thus additional.

#### **CAR8**

The PDD did not provide any detailed analysis of other activities similar to the project activity in the region as per step 4a of the additionality tool version 05 and hence CAR8 had to be raised however the same was closed on review of the revised PDD version 03 which includes the details of similar project activities in the region.

#### **Prior consideration of CDM benefits**

The project start date is validated to be 1<sup>st</sup> October 2008.

As the project start date is after 2<sup>nd</sup> August 2008, the validation team followed the Guidance on the demonstration and assessment of prior consideration of the CDM and evaluated relevant evidence. The "Guidance on the demonstration and assessment of prior consideration of the CDM" requires the project participant to inform a Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. However such notification is not necessary if a PDD has been published for global stakeholder consultation before the project activity start date which is project case wherein the PDD was published for global stakeholder consultation on 22<sup>nd</sup> July 2008 which is prior to the project activity start date of 1<sup>st</sup> October 2008. This clearly demonstrates the prior consideration of CDM revenues at the time of investment decision. However other supporting evidences were also reviewed by LRQA to confirm the serious consideration of CDM which includes review of the extracts of the Board meeting of VSIPL held on 3<sup>rd</sup> May 2007 and the engagement letter signed by VSIPL with CDM consultants. The board meeting minutes recorded indicated that to meet the total power requirement (18 MW) of manufacturing facility, PP considered the following three options 1) Import of electricity from the DVC 2) Installation of 15 MW AFBC based captive power plant along with 3 MW import of power from DVC (With coal fines and char as the main fuels which are available from the sponge iron kilns) 3) Installation of waste heat recovery based captive power plant and took inputs from the technical consultants on the same. ARK Engineering and Consultancy was appointed as the consultant for the power plant project by VSIPL. The same was verified through the review of letter dated 5<sup>th</sup> March 2007 acknowledged by ARK Engineering and Consultancy. The levelized cost of power generation for all three options were

compared which indicated that unit cost of 15 MW AFBC based power was generation was the lowest.

Through the interview conducted with top management of VSIPL, it was understood that Mr. Sandeep Jhunjhunwala, Director of the VSIPL was well aware about the CDM route and the possibility to implement the WHRB based power generation as a CDM project. Also the board meeting minutes makes reference to the similar project implemented by Vikash Metal and Power Limited who had started CDM related activities. The same was confirmed through the interviews conducted during the validation visit. Project participant then approached the consultant (Ernst & Young Private Limited) before investing in the project.

The chronology of events now presented in section B.5 of the PDD ver 3.0 has been validated through cross-checks with supporting documentation referenced.

#### **CAR6**

A CAR was requested to justify the serious CDM consideration of the project based on the special condition of the Environmental Clearance. The validation team confirmed that the special condition provided in the environmental clearance was due to fact that the PP had indicated in their application for the environmental clearance that WHRBs would be installed as part of cleaner technology based on the management decision on 3<sup>rd</sup> May 2007, which is to be based on the CDM benefits. This was verified from the application submitted to MoEF dated 15<sup>th</sup> June 2007. The PP has seriously considered the CDM benefits from the projects as evidenced from the discussion above. The PP has provided a detailed implementation timeline and the supporting evidences for the same. CAR6 was closed. (Refer Appendix F: Validation Findings Log)

## **4.4 Emission reductions**

### **Baseline Emissions**

The baseline emissions are calculated from the net power generation from the project activity, CO<sub>2</sub> emission factor 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<sub>2</sub>/MWh), fraction of total electricity generated by the project activity using waste gas, and energy that would have been produced in project year *y* using waste gas generated in base year. The calculations are as per the approved methodology.

Therefore following the guidance of the methodology, the baseline emission will be computed as:

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

Since there would not be any steam requirement in order to flare the waste gas generated from the DRI kilns at VSIPL 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, the baseline emissions from electrical energy generated by the project activity will be computed as:

$$BE_{En,y} = BE_{Elec,y} = f_{cap} \times f_{wcm} \times \sum_j \sum_i (EG_{i,j,y} \times EF_{Elec,i,j,y})$$

Determination of  $f_{cap}$  :-

The project activity consists of waste heat utilization from both existing ( 2 x 100tpd DRI) and new facility ( 3 x 100tpd DRI). Methodology specifies that a separate CDM project to be registered for additional capacity. To have the clarity, a clarification<sup>18</sup> was sought from the methodology panel on the followings:

(1) Since the determination of  $f_{cap}$  in ACM0012 requires that in case of planned expansion a separate CDM project should be registered for additional capacity, should PPs submit a separate PDD for expansion projects coming up under new facility? The entire project of 15 MW, including 8.4 MW of waste gas and 6.6 MW of AFBC is coming under one investment and therefore it may not be possible to split the project in to two. This is also relevant particularly due to the fact that the applicability condition of ACM0012 states that if a capacity expansion is planned, the added capacity must be treated as new facility;

(2) Can the QBL, product for the new kilns be determined based on:  
 (a) Historical data or manufacturer's data for existing DRI kilns;  
 (b) Manufacturer's data for the new DRI kilns due to unavailability of historical data.

The PP in accordance with the requirements of the methodology has applied the *Method 2 for "Capping of baseline emissions"* since historical data on energy released by the waste energy carrying medium was not available with the PP, which was confirmed during the site visit. Since two of the DRI kilns are existing and three will be coming up in future separate capping values have been considered for the existing kilns and the future kilns. Historical production figures has been considered to determine the  $f_{cap}$  of the existing kilns and manufacturer's data for normal operating conditions has been considered to calculate the  $f_{cap}$  for the upcoming kilns. With this consideration,  $f_{cap}$  will be determined as given below:

$$f_{cap \rightarrow 1,2} = \frac{Q_{WCM,BL \rightarrow 1,2}}{Q_{WCM,y,1,2}}$$

$$f_{cap \rightarrow 3,4,5} = \frac{Q_{WCM,BL \rightarrow 3,4,5}}{Q_{WCM,y,3,4,5}}$$

<sup>18</sup> [http://cdm.unfccc.int/UserManagement/FileStorage/AM\\_CLAR\\_YFF2OCX2PWGCYS7YE4XEEQSDTFARMP](http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_YFF2OCX2PWGCYS7YE4XEEQSDTFARMP)



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

$$Q_{WCM,BL,1,2} = Q_{BL,product,1,2} \times q_{wcm,product,1,2}$$

$$Q_{WCM,BL,3,4,5} = Q_{BL,product,3,4,5} \times q_{wcm,product,3,4,5}$$

Parameter	Value used	Validation opinion
Amount of waste energy per unit of product generated by the process in the industrial facility (for the 1 <sup>st</sup> & 2 <sup>nd</sup> kiln)  The same value is used for the 3 <sup>rd</sup> , 4 <sup>th</sup> and 5 <sup>th</sup> kiln	6,240 Nm3/ton	The value is based on the manufactures' data (i.e Poppuri Engineering & Consultancy Services) for waste gas volume of 26000 Nm3/hr and 300 days of operation (the value is same for the existing two and the three new DRI kilns as all DRIs have same specifications and is being supplied by the same technology supplier).  Poppuri process is well adapted in the sponge iron industry. More than 200 plants of various capacities i.e., 50TPD, 100TPD and 300TPD with an installed capacity of more than 30,000Tons per day of Sponge Iron in India are operating all over India, which are based on process knowhow supplied by Popurri Engineering. <sup>19, 20</sup>
Production by process that most logically relates to the waste gas generation in the baseline (1 <sup>st</sup> & 2 <sup>nd</sup> DRI kiln)	30,445 tonnes/annum	As required in the methodology, average annual historical production for the two existing kilns for three years has been considered. The production data provided for validation has been certified by chartered accountant RSPM & CO. The certificate provided by RSPM&CO dated 5 <sup>th</sup> June 2009 has been reviewed by the validation team.
Production by process that most logically relates to the waste gas generation in the baseline (3 <sup>rd</sup> , 4 <sup>th</sup> and 5 <sup>th</sup> DRI kiln)	90,000 tonnes/annum	As required in the methodology in case of new facilities, the manufacturer's data for normal operating conditions has been considered. The same is provided by the technology supplier (Poppuri Engineering & Industries Limited dated 06/09/2008) which confirms that each 100 TPD sponge iron plant can produce 30,000 tonnes of sponge iron per annum. Hence for the 3 new DRI kilns of 100 TPD capacity the annual production will be 90,000 tonnes.

<sup>19</sup> <http://www.popurigroup.com/index.html>

<sup>20</sup> <http://www.popurigroup.com/projects/?field=WEST+BENGAL&searching=yes&search=Search>

Parameter	Value used	Validation opinion
Quantity of waste energy generated in 1 <sup>st</sup> & 2 <sup>nd</sup> DRI kilns prior to the start of the project activity	189,977,337 Nm <sup>3</sup>	Calculated value based on the historical average production value of 30445 tonnes/annum and quantity of amount of waste energy the facility generates per unit of product which is 6240 Nm <sup>3</sup> / ton. The value is deemed appropriate.
Quantity of waste energy generated in 3 <sup>rd</sup> , 4 <sup>th</sup> and 5 <sup>th</sup> DRI kilns prior to the start of the project activity	561,600,000 Nm <sup>3</sup>	Calculated value based on the production value of 90000 tonnes/annum and quantity of amount of waste energy the facility generates per unit of product which is 6240 Nm <sup>3</sup> / ton. The value is deemed appropriate.

Based on above input values the for the 1<sup>st</sup> and 2<sup>nd</sup> DRI Kilns (existing facilities)  $f_{cap,1,2}=0.51$  and the same for the 3<sup>rd</sup>, 4<sup>th</sup> & 5<sup>th</sup> DRI Kilns connected to respective WHRBs (new facilities)  $f_{cap,3,4,5}=1$ .

#### Determination of $f_{wcm}$

For the project activity under consideration,

- Steam generated with waste gas of the DRI kilns from five number of WHRBs and
- Steam generated from the Atmospheric Fluidized Bed Combustion Boiler

will be fed to a common steam header and there from to the steam turbo-generator set for generation of power. Therefore  $f_{wcm}$  will be determined following the *Situation 2 of "Calculation of the energy generated in units supplied by waste gas/heat and other fuels"* as given below:

*Situation 1* is not applicable since no other fossil fuel(s) along with waste gas will be used for energy generation.

Applying situation 2 is deemed appropriate since

- All the boilers provide superheated steam –the same is confirmed from the technical specifications
- The calculation should be based on the energy supplied to the steam turbine. The enthalpy and the steam flow rate must be monitored for each boiler to determine the steam energy content. The calculation implicitly assumes that the properties of steam (temperature and pressure) generated from different sources are the same. The enthalpy of steam and feed water will be determined at measured temperature and pressure and the enthalpy difference will be multiplied with quantity measured by steam meter;
- Any vented steam should be deducted from the steam produced with waste gas/heat.- the same is confirmed from the project boundary diagram which indicates that there will be flow meters at the boiler outlets and a separate flow meter just before the inlet of the TG. Hence if any steam is vented it will be automatically taken into account (difference between the flow meter reading at the TG inlet and the sum of the flow meter reading at each boiler outlet).

The fraction of electricity generation from the waste heat of the existing DRI kilns and the proposed DRI kilns have been apportioned. This is due to the fact that  $f_{cap}$  has been determined separately for the existing and the future DRI kilns, and the method is conservative.

$$f_{wcm,1,2} = \frac{ST_{whr,1,2,y}}{ST_{whr,y} + ST_{other,y}}$$

$$f_{wcm,3,4,5} = \frac{ST_{whr,3,4,5,y}}{ST_{whr,y} + ST_{other,y}}$$

Parameter	Value used	Validation Opinion
Energy content of the steam generated in waste heat recovery boiler with heat content of waste gas of the 1 <sup>st</sup> & 2 <sup>nd</sup> DRI kilns and fed to turbine via common steam header	78,745,947,034 kcal	The energy content is calculated using the specific energy content value of 821.98 at 88kg/cm <sup>2</sup> pressure and 520°C temperature. The value used is deemed appropriate.
Energy content of the steam generated in waste heat recovery boiler with heat content of waste gas of the 3 <sup>rd</sup> , 4 <sup>th</sup> and 5 <sup>th</sup> DRI kilns and fed to turbine via common steam header	1.18119 x 10 <sup>11</sup> Kcal	The energy content is calculated using the specific energy content value of 821.98 at 88kg/cm <sup>2</sup> pressure and 520°C temperature. The value used is deemed appropriate.
Energy content of steam generated in AFBC and fed to turbine via common steam header	1.70147 x 10 <sup>11</sup> Kcal	The energy content is calculated using the specific energy content value of 821.98 at 88kg/cm <sup>2</sup> pressure and 520°C temperature. The value used is deemed appropriate.

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

The CO<sub>2</sub> 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:

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

Parameter	Value used	Validation Opinion
Overall efficiency of the existing plant that would be used by the jth recipient in absence of the project activity	28%	<p>Highest of the efficiency values provided by the below mentioned manufacturer's is used and the same is deemed appropriate and in accordance with the methodology requirements.</p> <ol style="list-style-type: none"> <li>1) Triveni Engineering &amp; Industries Ltd- 28%</li> <li>2) Cheema Boilers Ltd- 27%</li> <li>3) ARK Engineering &amp; Services-27%</li> </ol> <p>The values given by the manufacturer's are deemed appropriate. Triveni Engineering &amp; Industries Limited is one of the premier manufacturers of Steam Turbines in India up to 30 MW capacity. Triveni has over 2000 installations to a broad spectrum of industries<sup>21</sup>.</p> <p>Cheema Boilers Ltd is a trusted name in the field of Indian Boiler Industry and has worked for many Sponge Iron Plants in India<sup>22</sup>.</p> <p>ARK Engineering &amp; Services is the power consultant appointed for the project</p>

### **Project Emissions**

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

- Emissions from consumption of auxiliary fuel to supplement the heat content of the waste gas and
- Emissions from consumption of electrical energy for cleaning of waste gas prior to its utilization for generation of electrical energy or other supplementary electricity consumption

For the project activity under consideration, there is no provision for auxiliary fossil fuel firing in the waste heat recovery boiler to supplement the heat content of the waste gas. Therefore no project emission is considered while computing the *ex-ante* emission reductions resulting from the project activity.

Also in the project activity no additional waste gas cleaning over what is being done in the baseline scenario will be required. Therefore there will not be any additional energy consumption due to cleaning of waste gas in the project scenario. Therefore no project emission is considered while computing the *ex-ante* emission reductions resulting from the project activity. However to account for other supplementary electricity consumption if any, the emission reductions will be calculated as follows

<sup>21</sup> <http://www.trivenigroup.com/turbines/industry-wise.html>

<sup>22</sup> <http://www.cheemaboilers.com/clientDetails.aspx?ClientCategoryID=25>

$$PE_{EL,y} = EC_{PJ,Import,y} \times EF_{CO2,EL,y}$$

And as specified in the methodology if the electricity source for this supplementary consumption is from grid a default emission factor of 1.3 tCO<sub>2</sub>/MWh to be used. The same has been considered by the PP and in a conservative manner. The same is included in the monitoring plan.

Since there is provision of DG set on the project site which is planned to be used as backup electricity source in case of exigencies, the default CO<sub>2</sub> emission factor of 1.3 tCO<sub>2</sub>/MWh to be used to be used.

The fuel consumption and the net calorific value of the fuel combusted will be monitored as detailed in PDD version 03, section B.7.1.

### **Leakage Emissions**

No Leakage is considered for the project activity, which is as per the methodology.

### **Emission reductions**

The emission reductions resulting from the project activity will be computed as

$$ER_y = (BE_y - PE_y)$$

The project will reduce emissions which are real and measurable. The project is expected to result in emission reductions of approximately 59320 tCO<sub>2</sub> yearly, provided the principal assumptions do not change. The data sources mentioned have been verified by LRQA. In summary, the GHG calculations are complete and transparent, and their accuracy has been verified.

### **CAR9**

Whilst the PDD has applied method/situation 2 for the calculation of fraction of energy produced by the waste gas in project activity ( $f_{WG}$ ), the applicability criteria (as specified on page 16 of ACM0012 Version 02) is not justified in section B.6.1 of the PDD. All applicability criteria for applying method/situation 2 for calculation of  $f_{WG}$  has been clearly justified in the revised PDD version 03. Hence CAR9 is closed. (Refer Appendix F: Validation Findings Log)

### **CAR10**

PDD has applied method 2 for calculation of  $f_{cap}$  which is applicable in case of project activity is implemented in a new facility as per the applied methodology ACM0012 version 02. Hence justification on how the equation can be applied in the project case, where the PP has proposed to have project activity of using waste gas for power generation in both existing ( i.e. 2 x 100 TPD DRI) and new facility ( i.e. 3 x 100 TPD DRI) was required and hence CAR10 had to be raised.

The PP has applied the approved methodology version 3.1 to the project activity and subsequently based on the clarification (AM\_CL\_0141) the method 2 has now been correctly applied for the determination of  $f_{cap}$  as discussed above in the validation report.

**CAR11**

The efficiency of power plant ( $\eta_{Plant,j}$ ) for the calculation of  $E_{Elec,i,j,y}$  requires to have highest of two or more manufacturers of power plant with specifications similar to that would have been required to supply the recipient with electricity that it receives from the project activity. Whilst the same is provided from Triveni Engineering and Industries Ltd. and ARK Engineering and Consultancy, please clarify how ARK Engineering and Consultancy would be considered as a manufacturer of power plant, as the same agency is an engineering consultancy firm and is engaged by the PP for design and engineering consultancy for the project activity. In the revised PDD the efficiency of the power plant is taken in accordance with the methodology which is highest of the two values as provided by two manufacturer's: 1) Turbine Manufacturer (Triveni Engineering and Industries Ltd) 2) Boiler manufacturer (M/s Cheema Boilers Limited Dated 20/10.08) and Hence CAR11 is closed.

**CL4**

The emission reduction figures as given in Table A.4.4. is not presented in internationally accepted standard format. The revised PDD (version 03) presents the emission reduction figures in the internationally accepted format. Hence CL4 is closed.

Through the validation process LRQA have confirmed that:

- All the assumptions and data used by the project participants are listed in the PDD, including their references and sources;
- All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD;
- All values used in the PDD are considered reasonable in the context of the proposed CDM project activity;
- The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions;
- All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD.

## 4.5 Monitoring methodology and monitoring plan

The applied monitoring methodology is the ACM0012- "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" (Version 3.1). The monitoring plan is documented according to the applied methodology. It provides for the collection and archiving of all relevant data as listed in ACM0012. The measurement equipment and the measurement methods are described in the section B.7.1 of the PDD Version 3.0.

The monitoring plan presented in the PDD complies with the requirements of the methodology. The validation team has checked all the parameters presented in the monitoring plan against the requirements of the methodology; no deviations relevant for the project activity have been found in the plan. As a part of validation, LRQA has conducted document review and interviewed the project participants to ascertain the feasibility of the proposed monitoring plan. The quality assurance and quality control procedures adopted are deemed appropriate.

According to the PDD version 3.0 all relevant GHG emissions will be measured continuously with appropriate measurement equipment. All electrical parameters and the steam data will be captured & recorded by online non editable version of DCS, which ensures optimum reliability. The measuring equipments mainly flow meters, energy meters, temperature and pressure gauges will be subject to annual calibration. And the head of power plant will be responsible for the same. The procedure for maintenance of monitoring equipment is duly elaborated in the revised PDD version 3.0.

It was confirmed from the technical specifications of the waste heat recovery boilers that no other fuels would be used. But the provision of monitoring of other fuel consumption by each of the WHRBs is included in the monitoring plan, should that be case at any time.

The quantity of the waste gas consumed by each of the WHRB ( $Q_{WCM,y}$ ) would be monitored continuously after the WHRB from the flow meter placed between the WHRB outlet and ESP inlet that would provide representative waste gas volume.

LRQA considers that the monitoring plan is in compliance with the requirements of the methodology and the project participants are able to implement the monitoring plan.

#### **CAR12**

In the version 1 of the PDD, the monitoring plan was not provided in section B.7.2 of the PDD rather it was given in Annex 4 of the PDD which is not in accordance with the guidelines for CDM-PDD. Moreover, the monitoring plan was silent about the calibration frequency of the measurement equipments maintenance, maintenance of the monitoring systems and the emergency Procedures and hence CAR12 had to be raised. However revised PDD version 3 was modified to address all the requirements and hence CAR12 was closed.

#### **CL12**

There was inconsistency in the values of temperature and pressure of WHRB and AFBC considered in PDD and those given in detailed project report. And also the monitoring arrangement for each of the boiler was not clearly described in the PDD and hence CL12 had to be raised. However in the response PP clarified that "Manufacturer's specifications have been considered for the boilers and not the DPR values which was a pre-feasibility study document. Hence minor deviations are there between the DPR values and the manufacturer's specification." It was also clarified that the parameters like temperature, pressure and flow will be separately monitored for each of the boiler. The same was clearly indicated in the project boundary diagram. And hence CL12 was closed.



## 4.6 Duration of the project activity / crediting period

The PDD mentions the start date of the project activity as 1<sup>st</sup> October 2008 and the operational lifetime is expected for 25 years.

In the web-hosted PDD, the start date mentioned was the date of CDM consideration by the board of directors of the Vision Sponge Iron Ltd. which is not in accordance with the Glossary of CDM terms (Version 05) and hence CAR13 was raised during the course of validation. As a response to the CAR, PP has revised the start date in the PDD to the date of equipment supply contract signed with Triveni Engineering & Industries Ltd for the turbine dated 1<sup>st</sup> October 2008. The supporting evidence (equipment supply contract) was reviewed by the validation team. The same can be considered as the date on which the PP has committed to expenditures related to the implementation of the project and is in accordance with CDM Glossary of terms.

In validating the start date, the date of appointment of technical consultants for the project feasibility study, the date of completion of feasibility study/ preparation of the detailed project report were also reviewed.

Operational life of 25 years is considered reasonable for waste heat recovery based power plant. The same was verified from the website [http://www.cercind.gov.in/070104/appendix\\_2.doc](http://www.cercind.gov.in/070104/appendix_2.doc) and through the review of the letter from Hari Machines limited certifying the minimum lifetime of the 5 WHRBs as 25 years, letter from Triveni Engineering & Industries Ltd certifying the minimum lifetime of the turbine as 25 years and the letter from Popuri Engineering & Consultancy Services certifying the minimum lifetime of the kiln as 25 years. (Refer Appendix B)

The PP has selected the 10 years fixed crediting period. The starting date of crediting period is 01/04/2010 or from the date of project's registration as a CDM project activity. The crediting period may only start after the date of registration of the proposed activity as a CDM project activity.

## 4.6 Environmental impacts

The project participant has carried an environmental impact assessment study in accordance with the host country environmental regulations. The environmental impacts from the project activity have been identified and an environmental management plan has been designed to address the same. During the site visit the environmental impact assessment report was made available for validation which confirmed that the study was carried out in compliance with all the environmental regulations of the state and of host country.

The environmental impacts of the project have also been discussed in detail in the PDD. The project is not likely to create any adverse environmental impacts as well as transboundary impacts. Necessary licenses and environmental clearances have been obtained. The West Bengal pollution control board has also granted consent



to operate to the project. (Refer Appendix B for details of the consents and clearances obtained for the project)

The PP is to submit to the DOE, documentation on the analysis of the environmental impacts of the project activity if required by the host Party. The same has been provided to the DOE. A public hearing had already been conducted for the project activity and the notification for the public hearing was published in a local newspaper in local language so all the stakeholder's can participate. The same was confirmed by the validation team by reviewing the copy of local newspaper "Anand Bazar Patrika" dated 14/01/2008.

Also based on the satisfaction of the public hearing the project proponent has already received Consent to Establish for the power plant dated 27/08/2008 and NOC from the State Pollution Control Board. The same was reviewed by the validation team.

#### 4.7 Stakeholders' comments

The PP communicated about the project activity through written notification and requested the stakeholders to provide their feedback for the same. Stakeholders identified by the PP were company employees, local trade union and Panchayat Pradhan. PP had also published a notification about the public hearing for the project in the local news daily "Anand Bazar Patrika" on 14<sup>th</sup> January 2008 to invite public comments on the project activity, which also confirms that the West Bengal Pollution Control Authorities were also included as the stakeholders for the project activity.

Review of the responses received from the stakeholders (Refer Appendix B) shows that people were supportive to the project activity and expressed no negative comments on the project activity. As part of the validation, LRQA confirmed through the stakeholders interviewed during the site visit that they received the written notification and understood the project description presented in the notification.

##### **CAR14**

During the document review it was found that the invitation for comments from the local stakeholders was made by issuing notice in English to pre-selected stakeholders which indicate that the local stakeholder consultation was not conducted in open and transparent manner. In response to this the PP has clarified that a public hearing had already been conducted for the project activity and the notification for the public hearing was published in a local newspaper in local language so all the stakeholder's can participate. The same was confirmed by the validation team by reviewing the copy of local newspaper "Anand Bazar Patrika" dated 14/01/2008. In addition to these stakeholders the project proponent had also informed the Local Gram Panchayat, Trade Union and the Employees of M/S Vision Sponge Iron Private Limited about the project informally in the local language and they have appraised the project activity through feedback letters. The copy of the same has been reviewed by the validation team. CAR14 was closed.

The stakeholder consultation process, targeted stakeholders and due actions for concerned issues have been clarified on PDD.

## **5 Comments by parties, stakeholders and NGOs**

In accordance with the requirement of paragraph 40 of the CDM M&P, the PDD is to be made publicly available for 30 days subject to confidentiality provisions agreed with the PP, to enable comments to be received from Parties, stakeholders and UNFCCC accredited NGOs on the validation and registration requirements.

The PDD was made publicly available in accordance with the requirements of the procedure for the period of 22<sup>nd</sup> July to 20 August 2008  
(<http://cdm.unfccc.int/Projects/Validation/DB/3O1G1CQDLNO34CQBUT24OVZ1CX9TQ7/view.html>)

No comment was received during this period.

The estimated annual emission reductions of the project activity was 69,862tCO<sub>2</sub>e in the PDD made publicly available for the GSP. It was changed to 59,320tCO<sub>2</sub>e in the latest version of the PDD. There has been 15% reduction in ex-ante emission reduction during validation, that is primarily due to validation and application of reasonable PLF for the project activity and validation of  $f_{cap}$ .

## 6 Validation Opinion

LRQA has undertaken the validation of the proposed project activity “Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India” based on the requirements of CDM as set out in Article 12 of the Kyoto Protocol, the CDM M&P, the present annex, subsequent decisions made by the COP/MOP and CDM-EB, and the other rules applicable to the proposed project activity including the host country’s legislation and its specific requirements for sustainable development.

In order to arrive at the final validation conclusions and opinion, LRQA carried out document review of the PDD and related information, site visit, interview with PP, stakeholders and cross-check of evidences through alternate sources and independent reviews.

Through the process of the validation, the validation team identified 14 CARs and 13 CLs. The PP has taken actions and submitted to LRQA the revised PDD Version 2.0 and the other supporting evidences. These were reviewed and the findings were closed out. Overall conclusions with respect of this project activity can be briefly summarised as under:

- The PP has correctly applied ACM0012- “Consolidated baseline methodology for GHG emission reductions from waste energy reductions from waste energy recovery projects” (Version 3.1) to the project activity that waste heat recovery based captive power generation.
- Emission reductions have been calculated in a conservative manner
- PP was aware of CDM prior to the project start, benefits of CDM were seriously considered at the time of investment decision and that continued and real actions were taken by the PP to secure the CDM status of the project activity.
- The validation confirmed that the Levelized cost of electricity production for the project case was higher than the coal based power generation as per the project design to use mix of coal fines and char available at the facility and hence the project activity is additional.
- Monitoring plan has been suitably addressed and implementation of the plan by PP is feasible within the project design.
- There are no significant environmental impacts as a result of the project activity.
- The local stakeholder process was held in a clear and transparent manner and only positive comments were expressed. No negative comments were received during the local consultation process. No comments were received during the global stakeholder process.
- The project activity supports sustainable development criteria of host party as evidenced by the Letter of Approval from Host country.

The validation team is of the opinion that the proposed project activity confirms with all the relevant UNFCCC requirements for the CDM as well as the host country’s national requirements, and if implemented as designed, is likely to achieve the emission reductions and contribute to the sustainable development of the host country. Therefore LRQA requests the registration of “Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India”.

## 7 Appendices

### 7.1 Appendix A: Letters of approval for the project by the host and investing country DNA

Letter from Ministry of Environment & Forests, Government of India for host country approval to the project activity dated 4<sup>th</sup> August 2008

### 7.2 Appendix B: List of documents reviewed

#### Category A documents (documents from the PP)

- 1) The CDM-PDD for Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India Version 01 dated 29.02.2008
- 2) The CDM-PDD for Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India Version 02 dated 08.09.2008
- 3) The CDM-PDD for Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India Version 03 dated 19.05.2009
- 4) Extracts of the minutes of the meeting of the board of directors of Vision Sponge Iron Pvt Ltd. held on 03/05/2007
- 5) Specifications for 15 MW AFBC, 6.6 MW AFBC and proposed technical specifications for WHRB dated 24/04/2007 as provided by Veelsons Energy Systems Pvt Ltd.
- 6) Copy of the agreement with the Damodar Valley Corporation and Vision Sponge Iron Pvt Ltd. for contract demand of 3 MW dated 5th October 2005
- 7) Details of the investment cost of the baseline and project options dated 27/04/2007 as provided by ARK Engineering consultancy.
- 8) Evidence for the price of coal fines (Sales – Coal fines, Ledger account for the period 1<sup>st</sup> April 2006 to 31<sup>st</sup> March 2007 )
- 9) Certificate of analysis for Coal Fines given by Mitra S.K.Private Ltd dated 16/04/2008
- 10) Certificate of analysis for Char given by Mitra S.K.Private Ltd dated 19/05/2008
- 11) Details from ARK Engineering and Consultancy providing the project options to M/s Vision Sponge Iron Private Limited to cater their power requirements dated 24/04/2007.
- 12) Specifications from Triveni Engineering giving the efficiency of the power plant with and AFBC boiler dated 26/04/2007
- 13) Details from ARK Engineering and Consultancy giving the efficiency value for AFBC based power plant dated 26/04/2007
- 14) Energy Bills for the imported power from Damodar valley Corporation for the period 17<sup>th</sup> November 2005 to 15<sup>th</sup> July 2008
- 15) Flue gas analysis report given by Envirotech East Pvt. Limited dated 28/12/2007
- 16) Copy of Detailed Project Report given by ARK Engineering & Consultancy
- 17) Consent to Establish for 18 MW power plant dated 27/08/2008
- 18) Details from ARK Engineering and Consultancy giving the O&M expenses for the power plant operation dated 28/04/2007
- 19) Letter from Vision Sponge Iron Pvt Ltd. to ARK Engineering & Consultancy enquiring about the project options to cater the power requirement of the manufacturing facility dated 23/04/2007
- 20) Letter from Vision Sponge Iron Pvt Ltd. to ARK Engineering & Consultancy enquiring about the total cost implications for the suggested project options dated 26/04/2007

- 21) Copy of Notice sent to local stakeholders dated 01/04/2008
- 22) Response received from Vision Sponge Iron Loading/Unloading Labour Union dated 07/04/2008
- 23) Response received from Pradhan (Village head) of Beliatora Gram Panchayat dated 03/04/2008
- 24) Response received from plant employees of VSIPL dated 05/04/2008
- 25) Copy of local newspaper "Anand Bazar Patrika" dated 14th January 2008
- 26) Letter from ministry of environment and forests to Vision sponge Iron Pvt Ltd giving the specific and general conditions to get environmental clearance dated 03/07/2008
- 27) Copy of Host Country Approval dated 4<sup>th</sup> August 2008
- 28) Executive summary of the Environmental Impact Assessment carried out for the proposed project activity
- 29) Consent to operate under Water (Prevention and Control of Pollution) Act & Air (Prevention and Control of Pollution) Act, dated 15th January 2001
- 30) Consent to operate under Water (Prevention and Control of Pollution) Act & Air (Prevention and Control of Pollution) Act, dated 31st October 2005
- 31) Consent to operate under Water (Prevention and Control of Pollution) Act & Air (Prevention and Control of Pollution) Act, dated 9th November 2006
- 32) Consent to operate under Water (Prevention and Control of Pollution) Act & Air (Prevention and Control of Pollution) Act, dated 31st December 2007
- 33) Letter from West Bengal Pollution Control Board to M/s Vision Sponge Iron Private Limited giving the bill of advertisement of the notification of public hearing published in newspaper
- 34) Letter from West Bengal Pollution Control Board to M/s Vision Sponge Iron Private Limited dated 14/01/2008 which confirms that notification for public hearing was published in "Anand Bazar Patrika" on 14/01/2008
- 35) Letter from State Bank of Hyderabad dated 21/08/2008 to inform about the sanction of term loan to M/s Vision Sponge Iron Private Limited
- 36) Letter from Punjab National Bank dated 18/06/2008 to inform about the sanction of term loan to M/s Vision Sponge Iron Private Limited
- 37) Power and Fuel ledger account details for diesel for the period 1<sup>st</sup> April 2005 to 31<sup>st</sup> March 2006 and 1<sup>st</sup> April 2004 to 31<sup>st</sup> March 2005
- 38) Letter from Vision Sponge Iron Private Limited Popuri Engineering & Consultancy Services enquiring about the variation of PLF of WHRB based power generation dated 17/11/2008
- 39) Details from Popuri Engineering & Consultancy Services giving the variation of waste gas from the sponge iron kilns dated 20/11/2008
- 40) Letter from Vision Sponge Iron Private Limited to ARK Engineering & Consultancy enquiring about the power requirements of the different facilities dated 11/04/2007
- 41) Letter from ARK Engineering and Consultancy to M/s Vision Sponge Iron Private Limited giving the power requirements of the different facilities dated 13/04/2007
- 42) Copy of Equipment Supply Contract between M/s Vision Sponge Iron Private Limited and Triveni Engineering & Industries limited dated 01/10/2008 and technical specifications
- 43) Letter from Ministry of Environment and Forests notifying the National CDM Authority meeting date to Vision Sponge Iron Private Limited dated 09/04/2008
- 44) Letter from Vision Sponge Iron Private Limited to the Secretary, Ministry of

- Environment and Forests dated 0703/2008
- 45) Confirmation Letter from ARK Engineering and Consultancy sending the signed copy of agreement to Vision Sponge Iron Private Limited dated 05/03/2007
  - 46) Extracts of the Minutes of the meeting of the Board of Directors of M/s Vision Sponge Iron Private Limited, held on 06/04/2007
  - 47) Details from Cheema Boilers Limited giving the design efficiency of the coal based power plant dated 20/10/2008
  - 48) Details from Hari Machines limited certifying the minimum lifetime of the 5 WHRBs as 25 years –dated 09/05/2009
  - 49) Confirmation from Triveni Engineering & Industries Ltd certifying the minimum lifetime of the turbine as 25 years –dated 19/11/08
  - 50) Confirmation from Popuri Engineering & Consultancy Services certifying the minimum lifetime of the kiln as 25 years –dated 06/09/2008
  - 51) Confirmation from Vision Sponge Iron Private Limited to Superintendent, Central Excise, Purulia Range dated 20/10/2008 intimating the commercial production start date
  - 52) Confirmation from Vision Sponge Iron Private Limited to Superintendent, Central Excise, Purulia Range dated 11/10/2006 intimating the production start date for Kiln II
  - 53) Undertaking from Vision Sponge Iron Private limited for using any Overseas Development Assistance/Public funding for the project activity dated 20/10/2008
  - 54) Minutes of the consortium meeting of the lending banks of M/s Vision Sponge Iron Private Limited held on 24/10/2008
  - 55) Engagement letter for CDM Advisory Services between Vision Sponge Iron Private Limited and Ernst & Young Private Limited
  - 56) Letter from Popuri Engineering & Consultancy Services giving the technical specifications of the DRI Kilns dated 14/05/2009
  - 57) Certificate of the chartered accountant, RSPM &CO certifying the annual production values (October 2006 to April 2009) of the existing two DRI kilns at Vision Sponge Private Ltd. dated 5<sup>th</sup> June 2009
  - 58) Certificate of the chartered accountant, RSPM &CO certifying the electricity bill statements for the period October 2005 to June 2008 dated 5<sup>th</sup> June 2009
  - 59) Confirmation from the Popuri Engineering & Consultancy services dated 8<sup>th</sup> June 2009 giving the amount of waste gas generated per unit production
  - 60) Confirmation from Popuri Engineering & Consultancy services regarding the impact of Kiln Conditions on WHRB power plant dated 24<sup>th</sup> June 2009
  - 61) Confirmation from ARK Engineering & Consultancy clarifying about the higher O&M cost for the waste heat recovery based power plant
  - 62) Confirmation from ARK Engineering & Consultancy stating the capacity utilization of the sponge iron kilns and the steel melting shop
  - 63) Letter from ARK Engineering and Consultancy dated 25.07.2009 on the feasibility of waste gas monitoring.
  - 64) Flow meter specification (Rosemount inc)
  - 65) Emission Reduction calculation spreadsheet (Electronic Copy)
  - 66) Investment Comparison spreadsheet (Electronic Copy)

### Category B documents (other documents referenced)

- 1) ACM0012- "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" (Version 3.1)
- 2) Clean Development Mechanism Project design document form (CDM-PDD)
- 3) Guidelines for completing the project design document (CDM-PDD) and the Proposed New Baseline and Monitoring Methodologies (CDM-NM) (version 07).
- 4) Guidelines on the Assessment of Investment Analysis (EB41 Annex 45)
- 5) Guidelines on the Demonstration and Assessment of prior consideration of the CDM.
- 6) Clean Development Mechanism Validation and Verification Manual (EB44 Annex 3)
- 7) Eligibility Criteria for Host Country Approval, National CDM Authority, Ministry of Environment & Forests
- 8) Notification by Ministry of Environment & Forests dated 14th September 2006
- 9) Comprehensive Industry Document Series COINDS 66/2006-07 on Sponge Iron Industry published by Central Pollution Control Board, Ministry of Environment & Forests
- 10) Survey of Indian Sponge Iron Industry published in 2005 -06 by Joint Plant Committee
- 11) G.S.R Notification 414E published by ministry of environment and forests on 30<sup>th</sup> May 2008
- 12) Report of The Expert Committee on Fuels for power generation published by Government of India, Central Electricity Authority in February 2004
- 13) <http://rbi.org.in/home.aspx>
- 14) <http://www.steelworld.com/coalcri.htm>
- 15) <http://news.oneindia.in/2006/11/07/bengals-sponge-iron-industry-in-crisis-1162905455.html>
- 16) <http://www.steelworld.com/outlook0107.pdf>

## 7.3 Appendix C: List of persons interviewed

### Vision Sponge Iron Private Limited

Siddhartha Jhunhunwala	Director
Ajay Sharma	Employee Representative

### Ernst & Young Private Ltd

Arghya Paul	Consultant
Mayurika Chakraborty	Consultant

### Beliatora Gram Panchayat

Kamakhya Choudhari	Ex-Pradhan
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### Triveni Engineering & Industries Limited

Mr. Balsubramaniam



## 7.4 Appendix E: Certificate of Appointment

### Validation of “Waste Heat Recovery Based Power Generation at Vision Sponge Iron Private Limited, West Bengal, India”

We hereby certify that the following personnel have engaged in the validation process that has fully satisfied the competence requirements of the validation of the CDM project activity.

Name of Person	Assigned Roles
Prabodha C Acharya	Team Leader, CDM Lead Validator, Sector Expert
Shubha J Shanbhag	Team Member, CDM Validator
Swaroop Banerjee	Team Member, CDM Validator
Ketan S Deshmukh	Technical Reviewer, CDM Lead Validator
A V Shivaramakrishnan	Sector Expert to Technical Reviewer
Michiaki Chiba	Decision Maker

Signed by



Michiaki CHIBA  
Decision Maker,  
Climate Change Manager – Asia & Pacific



## 7.5 Appendix F: Validation Findings Log

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
CAR	Closed	<p>Followings are not described in the Project description as given in section A.2 of the PDD as per the recent CDM-PDD Guidelines :</p> <p>(a) The scenario existing prior to the start of the implementation of the project activity;</p> <p>(b) The project scenario, including a summary of the scope of activities/measures that are being implemented within the proposed project activity;</p> <p>(c) The baseline scenario, as identified in section B.4</p>	<p>The scenario existing prior to the start of the implementation of the project activity is clearly mentioned in version 03 of the PDD. The revised PDD clearly describes that the energy demand (0.90 MW for 2 kilns) was being met through import of electricity from DVC (Damodar Valley Corporation) and the in-house DG set. Audited energy bills and diesel purchase receipts were reviewed by the validation to confirm the same.</p> <p>The project scenario and a brief description of baseline scenario have also been clearly presented in the revised PDD.</p> <p>Section A.2 of the revised PDD is now in line with the CDM-PDD Guidelines version 07 and hence CAR1 is closed.</p>	General Description /PDD/A.2	25 Sep 08	CAR1	Guidelines for completing CDM-PDD Version 07
CAR	Closed	<p>Followings are not addressed in the PDD, while describing the technology to be employed by the project activity:</p> <ul style="list-style-type: none"> <li>Description of the scenario prior to the start of the project implementation with a list of equipments and systems operating at that time.</li> <li>Indicative list of the equipments and systems that would have been in place in the absence of the project activity in the baseline scenario.</li> <li>List and arrangements of the main manufacturing systems/equipments involved in the project activity including the information about age and average lifetime of the equipments based on manufacturer's specifications, industry standards, load factors and efficiencies.</li> <li>Details of monitoring equipments and their locations.</li> <li>The emission sources and the greenhouse gases involved in the project activity, according to the methodology used; and existing and forecast energy and mass flows and balances of the systems and equipments.</li> <li>The description of types and levels of services provided by systems and equipments that are being modified and/or installed under the project activity and their relation, if any to other manufacturing/production</li> </ul>	<p>Section A.4.3 of the revised PDD version 03 has been modified to accommodate all changes as required in the CDM PDD guidelines version 07.</p> <p>The emissions due to electricity import from grid or from onsite generation are now included and accordingly the methodological approach used for the calculation of emission reduction and monitoring section has been changed. The same has been reviewed by the validation team and found to be appropriate.</p>	Technology to be employed/ /PDD/A.4.3	25 Sep 08	CAR2	Guidelines for completing CDM-PDD Version 07

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
		<p>equipments and systems outside the project boundary.</p> <ul style="list-style-type: none"> <li>Explanation of how the same types and levels of services provided by the project activity would have been provided in the baseline scenario.</li> </ul>	Hence CAR2 is closed.				
CAR	Closed	<p>Section B.2 of the PDD states that “Emission reductions will not be affected by the waste gas that will be released under abnormal operations (emergencies shutdown). Please refer to B.6.1.” However, Description and justification on how such abnormalities would be accounted for is not described in the PDD.</p>	<p>PP clarified that “The Emission Reduction Values will not be affected by the release of waste under abnormal operations (emergencies, shutdown). This is due to the fact that the same thing would have happened in the Baseline scenario also.”</p> <p>Also revised PDD version 03 includes the monitoring of supplementary fossil fuel used under emergencies/shutdowns if any. The NCV of the fossil fuel fired will also be monitored under section B.7.1 of the PDD.</p> <p>In both the case of purchased electricity from grid and electricity generation on site for supplementary electricity consumption, the default emission factor of 1.3tCO<sub>2</sub>/MWh would be used.</p> <p>Hence CAR3 is closed.</p>	<p>Justification of choice of methodology/ PDD/B.2</p>	25 Sep 08	CAR3	Para. 37 (e) CDM M&P
CAR	Closed	<p>PP is requested to provide documentary evidence that “the waste gas is required to be combusted completely” is a legal requirement as claimed in elimination of alternative W1 as possible baseline.</p>	<p>The waste gas emanating from the DRI kiln contains high percentage of poisonous gas Carbon Monoxide. Hence it cannot be directly vented into the atmosphere without combustion. The same was verified from Central pollution Control Board document (<a href="http://www.cpcb.nic.in/upload/NewItems/NewItem_102_SPONGE_IRON.pdf">http://www.cpcb.nic.in/upload/NewItems/NewItem_102_SPONGE_IRON.pdf</a>)</p> <p>The Comprehensive Industry document series on Sponge Iron Industry published by Central Pollution Control Board, Ministry of Environment and Forests in March 2007 clearly states that “The hot DRI gases contains huge amount of fine dust comprising oxides and unburnt carbon and toxic carbon monoxide. It needs treatment before discharging into the atmosphere.” (Refer page 69 of the report. Also page 112-states that CO not to exceed 1% by volume.(which is as per Environmental standards)</p> <p>The same was confirmed with the review of GSR notification 414E published by ministry of environment and forest, dated 30<sup>th</sup> May 2008 (which was applicable at the time of completion of baseline study) confirms that the limit for CO for sponge iron plants is as mentioned above</p> <p><a href="http://www.envfor.nic.in/legis/ep/414E.pdf">http://www.envfor.nic.in/legis/ep/414E.pdf</a></p> <p>Hence the CAR4 is closed.</p>	<p>Details of baseline and its development/ PDD/B.4</p>	25 Sep 08	CAR4	Para. 37 (e) CDM M&P

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
CAR	Closed	Key assumptions and rationales used for identification of baseline scenario are not described in the PDD. For example, PDD does not describe in detail to demonstrate and justify that the identified baseline fuel i.e. Coal is available in abundance and there is no supply constraint. Please justify that how the carbon emission factor is lower for the identified baseline fuel out of the options considered in step 2 for baseline identification.	<p>Revised PDD version 03 clearly confirms the availability of the baseline fuel i.e. coal near the project site can be justified from the following links:  <a href="http://www.mapsofindia.com/maps/minerals/coal-mines-map.html">[http://www.mapsofindia.com/maps/minerals/coal-mines-map.html]</a>  <a href="http://www.mapsofworld.com/business/industries/coal-energy/india-coal-deposits.html">[http://www.mapsofworld.com/business/industries/coal-energy/india-coal-deposits.html]</a></p> <p>The map clearly shows the locations Ranigunj, Jharia and Bokaro to be very close to the project site. Hence there is no supply constraint for the identified baseline fuel i.e. coal.</p> <p>The baseline alternatives as presented in Section B.4 of the PDD for waste gas and power are          Among the plausible options for power generation, P4 – Power generation from a coal based captive power plant and P6-Import of power from grid an economic analysis was conducted (Source: Unit cost of generation), it was found that Unit cost of generation from Coal based captive power plant was the most economical compared to import of power from DVC which is Rs 3.10/kWh. Audited electricity bills have been reviewed by the validation team to confirm the cost of import from grid. And also the Levelized cost of grid tariff over the crediting period has been calculated applying a discount rate of 12.25% which comes to be 4.9 INR/KWh and hence would be clearly economically unattractive and eliminated as per the methodology requirement. Hence, power generation from coal based power plant is selected to be the baseline alternative.</p> <p>PP also analyzed diesel based power plant as the possible alternative but however the option was very expensive. The cost of diesel based power generation is about Rs 7-8/kWh.          Source:<a href="http://www.iea.org/textbase/work/2006/gb/papers/power_india.pdf">http://www.iea.org/textbase/work/2006/gb/papers/power_india.pdf</a>  <a href="http://www.cea.nic.in/thermal/Special_reports/Report%20of%20the%20expert%20committee%20on%20fuels%20for%20power%20generation.pdf">http://www.cea.nic.in/thermal/Special_reports/Report%20of%20the%20expert%20committee%20on%20fuels%20for%20power%20generation.pdf</a>          Hence among the plausible options for power generation, power generation through a coal based CPP is the most economically viable one.</p> <p>This is in accordance to the steps outlined for Identification of baseline scenario in ACM0012, Version 03.1. As per Page 10 of ACM 0012, Step 4 of the selection of baseline scenario states that the alternative with the lowest baseline emissions shall be considered as the most likely baseline scenario if more than one credible and</p>	Details of baseline and its development/ PDD/B.4	25 Sep 08	CAR5	Para. 37 (e) CDM M&P

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
			plausible alternative scenario remains. As explained above, there remains one and only one alternative to the project- P4 – Power generation from a coal based captive power plant and the same is selected as the baseline.				
CAR	Closed	<ul style="list-style-type: none"> <li>The PP to justify how incentives from CDM was seriously considered in the decision to proceed with the project activity keeping in view that the Environmental Clearance (vide J-11011/609/2007-IA II (I) dated 03.07.2008) from Ministry of Environment and Forests (MoEF), Govt. of India accorded to the facility expansion specifically requires that “New DRI Kiln shall be provided with waste heat recovery boilers (WHRB) to make use of flue gases generated during the process”. (Special condition ii).</li> <li>Implementation timeline of the proposed CDM project activity and timeline of events and actions, which have been taken to achieve CDM registration, with description of the evidence used to support these actions not provided in the PDD.</li> </ul>	<p>The Date of Board Consideration for CDM, was dated 03.05.2007. M/s Vision Sponge Iron Private Limited applied for the Environmental Clearance with the consideration that they will be setting up 5 WHRB boilers as a part of the expansion plan. M/s Vision Sponge Iron Private Limited already presented to MoEF that their expansion plan will include installation of five WHRB boilers, two for the existing 2 kilns and three for the 3 new kilns with an objective to gain CDM benefits. Hence following the same in the environmental clearance it is mentioned that “New DRI Kiln shall be provided with waste heat recovery boilers (WHRB) to make use of flue gases generated during the process”</p> <p>Also implementation timeline of the proposed CDM project activity and timeline of events and actions have been incorporated in the Section B.5 of the PDD/Version 02.</p> <p>Documented evidences to support the timelines have been verified by the validation team and hence CAR6 is closed.</p>	Additionality/ PDD/B.5	25 Sep 08	CAR6	Para. 43 CDM M&P
CAR	Closed	The project proponent has used investment comparison analysis for the unit cost of service including the 3MW power import from grid. Since the base line is coal based power plant and the project activity is waste heat power generation, please justify why the electricity import to be considered in cost comparison.	<p>It was clarified by the PP that during assessing the viability of the project, all the options which can meet their total power requirement were considered. Even after power generation through the steam of WHRBs and AFBC the 3 MW power will be sourced from Damodar Valley Corporation to meet the total power requirement. Hence weighted average unit cost of generation taking into account all the sources of electricity both the in the baseline and the project case for the same level of output services was computed. The same was performed during the investment decision and was confirmed through the review of board meeting minutes extract.</p> <p>As a response to this corrective action request, PP has also tabulated the levelized cost of electricity generation for the base and project case and the same is verified by the validation team for the correctness of input values and method of calculations. CAR7 is closed.</p>	Additionality/ PDD/B.5	25 Sep 08	CAR7	Para. 43 CDM M&P

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
CAR	Closed	The PDD has not details analysis of other activities similar to the project activity in the region as per step 4a of the additionality tool version 05.	Step 4a of the additionality tool has been applied in the revised PDD version 03 and the CAR8 has been closed.	Additionality/ PDD/B.5	25 Sep 08	CAR8	Para. 43 CDM M&P
CAR	Closed	Whilst the PDD has applied method/situation 2 for the calculation of fraction of energy produced by the waste gas in project activity ( $f_{WG}$ ), the applicability criteria (as specified on page 16 of ACM0012 Version 02) is not justified in section B.6.1 of the PDD.	The PP has applied version 3.1 of the methodology in the revised PDD. All applicability criteria for applying method/situation 2 for calculation of $f_{WG}$ has been clearly justified in the revised PDD version 03.  Hence CAR9 is closed.	Emission Reductions/ PDD/B.6.1	25 Sep 08	CAR9	Para.37(d) & 43 CDM M&P
CAR	Closed	PDD has applied method 2 for calculation of $f_{cap}$ . This is applicable in case of project activity is implemented in a new facility as per the applied methodology ACM0012 version 02. Please justify how the equation can be applied in the project case, where the PP has proposed to have project activity of using waste gas for power generation in both existing ( i.e. 2 x 100 TPD DRI) and new facility ( i.e. 3 x 100 TPD DRI).	The PP has applied the recent version of the methodology i.e ACM0012 Version 03.1. Subsequently the clarification (AM_CL_0141) has been sought from the methodology panel. As per the proposed method in the clarification PP has applied separate capping values for existing and new facility based on actual production data and on Manufacturer's Specification for normal operating conditions, which were validated conservatively.  CAR10 is closed.	Emission Reductions/ PDD/B.6.1	25 Sep 08	CAR10	Para.37(d) & 43 CDM M&P
CAR	Closed	The efficiency of power plant ( $\eta_{Plant,j}$ ) for the calculation of $EF_{elec,i,j,y}$ requires to have highest of two or more manufacturers of power plant with specifications similar to that would have been required to supply the recipient with electricity that it receives from the project activity. Whilst the same is provided from Triveni Engineering and Industries Ltd. and ARK Engineering and Consultancy, please clarify how ARK Engineering and Consultancy would be considered as a manufacturer of power plant, as the same agency is an engineering consultancy firm and is engaged by the PP for design and engineering consultancy for the project activity.	In accordance to the methodology the efficiency of the power plant in the baseline case has been taken as the higher of the two values as provided by two manufacturers' and found to be conservative.  Hence CAR11 is closed.	Emission Reductions/ PDD/B.6.1 & B.6.2	25 Sep 08	CAR11	Para.37(d) & 43 CDM M&P
CAR	Closed	The monitoring plan is not provided in section B.7.2 of the PDD rather it is given as Annex 4 of the PDD which is not in accordance with the guidelines for CDM-PDD. Moreover, the monitoring plan given in Annex 4 is silent about <ul style="list-style-type: none"> <li>Calibration frequency for the meters (flow meters,</li> </ul>	The monitoring plan has been mentioned in the section B.7.2 of the PDD in accordance to the guidelines for CDM-PDD.  The monitoring plan given in section B.7.2 of PDD Version 03 also details about the calibration frequency of the monitoring equipments,	Monitoring plan/PDD/ B.7.2&Annex 4	25 Sep 08	CAR12	Para. 53 CDM M&P

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
		energy meters) and maintenance of those records <ul style="list-style-type: none"> <li>Maintenance of the monitoring systems (for e.g. replacement of faulty meters )</li> <li>Emergency Procedures</li> </ul>	maintenance of the monitoring systems and the emergency procedures.  Hence CAR12 is closed.				
CAR	Closed	The start date mentioned in section C.1.1 is not in accordance with the Glossary of CDM terms (Version 04) and Section C.1.1 does not describe that how is the start date determined and also the description of evidence available to support this start date is not mentioned in the PDD.	The start date of the project activity has been modified to the date of Contract with the Turbo-generator Manufacturer which is now in accordance with the Glossary of CDM terms.  Hence CAR13 is closed.	Starting date/PDD/C.1.1	25 Sep 08	CAR13	Guidelines for completing CDM-PDD Version 07
CAR	Closed	The invitation for comments from the local stakeholders was found to be made by issuing notice in English to pre-selected three stake holders i.e Panchayat Pradhan, Employees of VISL and Local Trade Union on 01.04.2008. PP to please justify, how this process can be considered as open and transparent as it does not allows to reach beyond the pre-selected stake holders. The notification was made in English language, which when interacted with the stake holders during the site visit found comfortable in the local language.	PP has clarified that a public hearing had already been conducted for the project activity and the notification for the public hearing was published in a local newspaper in local language so all the stakeholder's can participate.  The same was confirmed by the validation team by reviewing the copy of local newspaper "Anand Bazar Patrika" dated 14/01/2008.  Also based on the satisfaction of the public hearing the project proponent has already received Consent to Establish for 18 MW power plant dated 27/08/2008 and NOC from the State Pollution Control Board.  The same was reviewed by the validation team.  Hence both MoEF, Govt of India and West Bengal Pollution Control Board were also stakeholders to the project activity. In addition to these stakeholders the project proponent had also informed the Local Gram Panchayat, Trade Union and the Employees of Vision Sponge Iron Private Limited. They have appraised the project activity through letters. The copy of the same has been reviewed by the validation team.  Hence it confirmed that the local stakeholder consultation was carried out in a open and transparent manner. CAR14 is closed.	Stakeholder's comments/PDD/E	25 Sep 08	CAR14	Para. 37 (b) CDM M&P & Guidelines for completing CDM-PDD Version 07
CL	Closed	The PDD describes that the PP proposes to set up 15 MW captive power plant (CPP) based on 5 Waste Heat recovery Boilers (WHRB) and one coal based fluidised bed boiler (FBC). But the organisation has obtained Environmental clearance for 18MW CPP (vide J-	It was clarified by the PP that "In the Environmental clearance it is mentioned that for 18MW CPP (vide J-11011/609/2007-IA II (I) dated 03.07.2008) that the capacity of the power plant will be 18 MW." But M/s Vision Sponge Iron Private Limited has postponed the plan of implementing the Coal Washery (0.5 MTPA) and the	Project Activity/PDD/A.2	25 Sep 08	CL1	Guidelines for completing CDM-PDD Version 07

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
		11011/609/2007-IA II (I) dated 03.07.2008) and Consent to Establish for 18MW CPP (vide 316-2N-95/2007(E) dated 27.08.2008). The inconsistency of the CPP capacity as per the project description and legal clearances to be clarified.	<p>Ferro Alloy Plant (18,514 MTPA). [The same was confirmed by review of Extract of Minutes of the meeting of board of directors dated 06/04/2007]. This led to the reduction of the total power requirement as envisaged earlier.</p> <p>Hence the total power requirement of the other facilities i.e. Sponge Iron kilns, Steel Melting shop and the auxiliary requirement of the power plant will be to the tune of 18 MW.[the same is confirmed through the letter dated 13/04/2008 from M/s ARK Engineering &amp; Consultancy Limited]. Hence to meet the total power requirement M/s Vision Sponge Iron Private Limited will install a captive power plant of 15 MW and the remaining power will be sourced from Damodar Valley Corporation. (Copy of the agreement with the Damodar Valley Corporation and Vision Sponge Iron Pvt Ltd. for contract demand of 3 MW dated 5th October 2005)</p> <p>The equipment supply contract with Triveni Engineering for the turbine is of a power generating capacity of 15 MW.</p> <p>Letter of intimation to West Bengal Pollution Control Board dated 7<sup>th</sup> MAY 2009 of change in consent conditions is also reviewed by the validation team.</p> <p>Hence CL1 is closed.</p>				
CL	Closed	Project site specific latitude and longitude details not provided to indicate the unique identification of the project activity.	Project specific latitude and longitude details to indicate unique identification were included in the Version 02 of the PDD dated 22/11/2008 and hence CL2 was closed.	Details of physical location/PDD/A.4.1.4	25 Sep 08	CL2	Guidelines for completing CDM-PDD Version 07
CL	Closed	<p>Following inconsistencies to be clarified:</p> <ul style="list-style-type: none"> <li>The WHRB capacity is described as 38TPH in PDD, page 6, where as the same is given as 11TPH in DPR (page 16) and NOC (Consent to establish vide 316-2N-95/2007(E) dated 27.08.2008) has been obtained for 5 numbers of 10TPH WHRB</li> <li>The steam temperature for the Turbo Generator (TG) is mentioned to be 515 degree C in PDD, page 7, while the same is given as 510 degree C in DPR, page 14 &amp; 38.</li> </ul>	<p>The WHRB capacity i.e. the Maximum Continuous Rating (MCR) is 10 TPH each. However it has been assumed that during any point of time any one of the DRI kiln will be under shutdown for maintenance purpose. This is due to accretion problem as well as fluctuations/inconsistencies in waste gas supply of the DRI kiln. Hence the steaming capacity of the WHRB has been taken as 9.5X4 TPH i.e. 38 TPH to be on the conservative side.</p> <p>The specifications of the WHRB and AFBC are in accordance to the analysis carried out by a boiler manufacturer Vecons Energy Systems Pvt. Limited. The same is be verified through letter dated 24.04.07 from Vecons Energy System Pvt. Limited to the project proponent. All the boiler specifications are in accordance to the</p>	Technology to be employed/ /PDD/A.4.3	25 Sep 08	CL3	Guidelines for completing CDM-PDD Version 07

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
			<p>specifications given by the boiler manufacturer.</p> <p>The steam temperature of the Turbo Generator (TG) is 510C +/- 5C. The value is verified through the contract document with the Turbine Manufacturer (Triveni Engineering) dated 01 October 2008.</p> <p>It was clarified by the PP that DPR was only a part of pre-feasibility study and hence some minor deviations were found.</p> <p>Hence CL3 was closed.</p>				
CL	Closed	The emission reduction figures as given in Table A.4.4. is not presented in internationally accepted standard format.	<p>The revised PDD (version 03) presents the emission reduction figures in the internationally accepted format.</p> <p>Hence CL4 is closed.</p>	Emission reduction Estimate/PDD/A4.4.	25 Sep 08	CL4	Guidelines for completing CDM-PDD Version 07
CL	Closed	Details of the project funding with evidence to be provided to demonstrate the statement that no public funding from parties included in Annex-I is available to the project activity.	<p>The project is funded through equity and loans from the banks and no ODA has been used for funding the project activity. The documents reviewed by validation team to confirm the same are</p> <ul style="list-style-type: none"> <li>Self-declaration provided by PP, dated 20/10/2008 states that no ODA/public funding is used for the project.</li> <li>Minutes of the consortium meeting of the lending banks of M/s Vision Sponge Iron Private Limited held on 24/10/2008</li> <li>Letter from State Bank of Hyderabad dated 21/08/2008 to inform about the sanction of term loan to M/s Vision Sponge Iron Private Limited</li> <li>Letter from Punjab National Bank dated 18/06/2008 to inform about the sanction of term loan to M/s Vision Sponge Iron Private Limited</li> </ul> <p>Hence CL5 is closed.</p>	Public funding of the project/PDD/A.4.5.	25 Sep 08	CL5	Para. 35 CDM M&P & Guidelines for completing CDM-PDD Version 07
CL	Closed	<ul style="list-style-type: none"> <li>Energy balance of the relevant sections of the plant to be provided to demonstrate that the waste gas was not a source of energy before the implementation of the project activity as stated in the Section B.2 of the PDD.</li> <li>Evidence for the date of commercial production in the existing facility to be provided.</li> </ul>	<p>Section B.2 of the PDD has been modified in the PDD version 02 to include <b>Energy bills</b> (electricity, fossil fuel) to demonstrate that all the energy required for the process has been procured commercially. The project proponent has already submitted the electricity/energy bills from October'2005 to July'2008 to substantiate the same. It suggests the power requirement was solely met by import of power from DVC in the pre-project scenario.</p> <p>As required in the methodology the bills were audited by Chartered Accountant RSPM &amp; CO and a certificate (dated 5<sup>th</sup> June 2009) for the same was made available for validation.</p> <p>Hence CL6 is closed.</p>	Justification of choice of methodology/PDD/B.2	25 Sep 08	CL6	Para. 37 (e) CDM M&P



Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
CL	Closed	Evidence of the life time for all equipments to be provided for justification of the statement in the PDD that “all equipments to be installed under the project activity will be newly procured and will have lifetime exceeding 15years...”.	<p>PDD version 02 revised the operational lifetime of the project activity to 25 years.</p> <p>Following documents were reviewed by the validation team to verify the operational lifetime of 25 years mentioned in PDD Version 02</p> <ol style="list-style-type: none"> <li>1. Letter from Hari Machines limited certifying the minimum lifetime of the 5 WHRBs as 25 years –dated 09/05/2009</li> <li>2. Letter from Triveni Engineering &amp; Industries Ltd certifying the minimum lifetime of the turbine as 25 years –dated 19/11/08</li> <li>3. Letter from Popuri Engineering &amp; Consultancy Services certifying the minimum lifetime of the kiln as 25 years – dated 06/09/2008</li> </ol> <p>Hence CL7 was closed.</p>	Justification of choice of methodology/PDD/B. 2	25 Sep 08	CL7	Para. 37 (e) CDM M&P
CL	Closed	The project boundary diagram given in section B.3 of the PDD does not include all the equipments (for e.g. ABC) , mass and energy flows , emission sources ,gases included in the project boundary and the monitoring variables. Inconsistencies in the specification of AFBC (85kg/cm2 at 510 degree C as per DPR) and WHRB (i.e. tempt is mentioned as 520 degree C in DPR and page 6 of PDD, where as the same is mentioned as 510 degree C) steam characteristics to be clarified.	<p>The project boundary diagram has been modified in the PDD/Version 02.</p> <p>The specifications of the WHRB and AFBC are in accordance to the analysis carried out by a boiler manufacturer Vecons Energy Systems Pvt. Limited. The same is verified through letter dated 24.04.07 from Vecons Energy System Pvt. Limited to the project proponent. All the boiler specifications are in accordance to the specifications given by the boiler manufacturer.</p> <p>The project boundary diagram given in PDD version 02 was still not addressing the emissions sources (emergency power consumption i.e. DG, any other fossil fuel and the monitoring variables i.e Pressure, Tempt, Flow etc).</p> <p>The same has been modified in the PDD/Version 03</p> <p>Hence CL8 is closed.</p>	Description of the sources and gases included in the project boundary/PDD/B.3	25 Sep 08	CL8	Para. 37 (e) CDM M&P
CL	Closed	Please provide clarification on what are all renewable resources were considered in the baseline option P5 and evidence to justify that such resources have limited availability around the project site.	<p>The different renewable energy sources that have considered are Hydro, Biomass, and Wind etc. Out of these three, the availability of wind and biomass is very limited in the state of West Bengal. The same can be validated from the annual report of MNES sources. The link to the same is provided in the PDD.</p> <p>Moreover renewable resource based power generating stations typically used for peak load services and not for base load services which are important for sponge iron manufacturing. This is due to long gestation period and economic and social costs associated with rehabilitation and resettlement of the population affected by submergence of land.</p>	Details of baseline and its development/PDD/B. 4	25 Sep 08	CL9	Para. 37 (e) CDM M&P ACM0012/Version 02

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
			<p>The MNRE report confirms that biomass and wind availability in the state of West Bengal is limited in comparison to other states Justification provided for hydro power is also found to be acceptable</p> <p>Hence CL9 is closed</p>				
CL	Closed	<p>Followings to be clarified related to the unit cost comparison analysis (VSIPL_Financials_Revised_26082008.xls)</p> <p>1) 365 days of operation is considered for the AFBC plant in baseline and project case. How the annual maintenance, shut down and abnormalities in operation are accounted for.</p> <p>2) Please justify the high level of PLF at 90.4% considered in both baseline and project activity.</p>	<p>1) The annual maintenance, shut down and abnormalities in operation have now been accounted for. Hence 330 days of annual operation have been considered in baseline case and 300 for the project case. The same is deemed appropriate considering the 66 capacity utilization factor for the Kiln &amp; WHRB and the same is verified from the letter given by the ARK Engineering &amp; Services.</p> <p>2) The project design assumes that at any given point of time 4 WHRBs will be operational and one will be in a shut-down mode. The power generation capacity has been taken for four WHRB boilers to be on the conservative side. The same can be verified through the letter from ARK Engineering and Consultancy dated 24.04.07 and letter from Vecons Energy Systems Pvt. Limited dated 24.04.07 during the feasibility study of the project. Hence the value has been considered. The AFBC boiler in both the project and the baseline case is not subjected to any technological barriers as the WHRBs are subjected to. (Source: <a href="http://www.ntpc.co.in/cms/index.php?page=Turnaround-Capability">http://www.ntpc.co.in/cms/index.php?page=Turnaround-Capability</a>) A different PLF value has now been assumed for the AFBC and the WHRB.</p> <p>3) The fuel analysis for fuel mix (coal fines &amp; char) has been reviewed by the validation team and also cross verified from the Detailed Project Report (Page number 13)</p>	<p>5</p> <p>Additionality/PDD/B.</p>	25 Sep 08	CL10	Para. 43 CDM M&P
		<p>3) Please provide fuel analysis for the fuel mix (coal fines &amp; char) to be used in AFBC</p> <p>4) Certificate of Analysis for Coal fines (dated 16/04/2008) indicates that the net calorific value is 4572 Kcal/kg whereas the GCV for coal fines used in</p>	<p>4) Now the net calorific values for char and coal has been derived from the GCV values given in DPR (page 13), the ultimate fuel analysis results and the IPCC formula for calculation of NCV.</p>				

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
		the spreadsheet calculations is 4500 Kcal/kg which is lower than the NCV. Please clarify the same.	5) Same as above				
		5) Certificate of Analysis for Char (dated 19/05/2008) indicates that the net calorific value is 2026 Kcal/kg whereas the GCV for char used in the spreadsheet calculations is 2000 Kcal/kg which is lower than the NCV. Please clarify the same.					
		6) Provide the basis for considering a common depreciation rate at 3.6% for the building, plant and machinery.	6) An weighted average depreciation rate has been considered in accordance to the guidance provided in the CERC order (Petition No: 140/2005) [http://www.cercind.gov.in/03022007/No-140-05-doh-22-5-07.pdf]				
		7) The depreciation is calculated based on the total cost, which includes services, taxes, land development, deposits etc. Please clarify.	7) The depreciation calculation has been modified excluding services, taxes, land development, deposits costs.				
		8) Provide the basis for salary breakup given for the project case (AFBC 6.6 MW and WHRB 8.4 MW)	8) The salary break-up of the personnel has been prepared based on the estimation of the power plant consultants ARK Engineering and Consultancy through letter dated 28.04.07. In the baseline scenario there will be 1 AFBC boiler and 1 turbo-generator whereas in the project scenario there will be 5 WHRB boilers, 1 AFBC boiler and 1 Turbo-generator. Hence the number of personnel in the project scenario is much higher than the baseline scenario. The salary break-up has been prepared by the power plant consultants on the same basis. The letter given by Power consultant (ARK Engineering) is reviewed and the justifications are found to be acceptable.				
		9) Turbine generator cost is accounted separately for the AFBC 6.6 MW & WHRB 8.4 MW in project case, which is INR 54 million and INR70million respectively. Please justify the same for the project case as a single TG is proposed.	9) A single TG is proposed for the project activity. And now the cost of the same has been apportioned on the basis of power generating capacity of WHRB and AFBC.				

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
		<p>10) Letter of ARK Engineering&amp; Consultancy giving the cost break up for 6.6 MW AFBC and 8.4 WHRB includes the land development and Government deposit charges for AFBC and WHRB plant separately. Please clarify that why would land development and government charges be paid separately for each of the component.</p> <p>11) Please provide justification and evidence of the interest rate 12% as used.</p>	<p>10) The land development charges are not included for the project and base cases. The same is found to be conservative and justified.</p> <p>11) The Interest rates has been assumed to be prime lending rate as published by RBI and the same was applicable at the time of investment decision and found to be OK.</p>				
CL	Closed	Justify the basis of selection of parameters used for sensitivity analysis and why the operation and maintenance cost would not be considered for sensitivity analysis. Please provide clarification on – why the fluctuation of PLF within the range of $\pm 5\%$ in sensitivity analysis is considered appropriate.	In response to this a revised sensitive analysis was performed considering a 10% variation in critical parameters. Variables like coal price, grid power purchase cost , the plant load factor, initial investment cost and the O&M cost which constitute more than 20% of total project cost /project revenues were subjected to reasonable variation. The same was reviewed by validation team for the correctness of input values and for the range of variations selected and found to be done appropriately. Hence CL11 was closed.	Additionality/PDD/B.5	25 Sep 08	CL11	Para. 43 CDM M&P
CL	Closed	<ul style="list-style-type: none"> <li><math>ST_{whr,y}</math> &amp; <math>ST_{other,y}</math> are presented in the PDD based on the enthalpy at 510 degree C and 88 kg/cm<sup>2</sup> pressure for both WHRB and AFBC, whereas the DPR values are 520 degree at 88 kg/cm<sup>2</sup> pressure for WHRB and 510 degree at 85 kg/cm<sup>2</sup> pressure for WHRB.</li> <li>PP to clarify in PDD, if the parameters related to <math>ST_{whr,y}</math> to be monitored for each WHRB separately or from the common steam header, as it is not clear in the PDD.</li> <li>The method of verifying the consistency and accuracy of the monitored value of <math>EG_{i,j,y}</math> to be clarified.</li> </ul>	<p>It was clarified by the PP that “Manufacturer’s specifications have been considered for the boilers and the turbine and not the DPR values which was a pre-feasibility study document. Hence minor deviations are there between the DPR values and the manufacturer’s specification.”</p> <p>The specifications of the WHRB and AFBC are in accordance to the analysis carried out by a boiler manufacturer Vecons Energy Systems Pvt. Limited. The same is verified through letter dated 24.04.07.</p> <p><input type="checkbox"/> The parameters related to <math>ST_{whr,y}</math> i.e. temperature, pressure and flow will be monitored separately for all the boilers. It is now clearly mentioned in the project boundary diagram in the PDD/Version 02.</p> <p><input type="checkbox"/> The method of verifying the consistency and accuracy of the monitored value of <math>EG_{i,j,y}</math> has been clearly mentioned in the Section B.7.1 of the PDD/Version 02.</p> <p>And hence CL13 is closed.</p>	Data & Parameters monitored/ PDD B.7.1	25 Sep 08	CL12	Para.37(d) & 43 CDM M&P

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
CL	Closed	Contact information of the person(s)/entity(ies) responsible for the application of the baseline and monitoring methodology to the project activity not provided and please confirm if the person/entity is also a project participant listed in Annex 1.	Contact information of the person(s)/entity(ies) responsible for the application of the baseline and monitoring methodology is same as mentioned in Annex 1 of the PDD/Version 03. Reviewed PDD clearly indicates that the entity listed in B.8 is the project participant and hence CL14 is closed.	Date of completion & application of baseline methodology/PDD/B.8	25 Sep 08	CL13	Para. 53 CDM M&P & Guidelines for completing CDM-PDD Version 07

## 7.6 Appendix G: Validation of the baseline scenario

### Use of Waste Energy for existing facility consisting of 2 DRI Kilns

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation of final result
W1	Y	Local regulations	<p>The waste gas emanating from the DRI kiln contains high percentage of Carbon Monoxide that cannot be directly vented into the atmosphere without combustion as per the Central pollution Control Board directive  <a href="http://www.cpcb.nic.in/upload/NewItems/NewItem_102_SPONGE_IRON.pdf">http://www.cpcb.nic.in/upload/NewItems/NewItem_102_SPONGE_IRON.pdf</a></p> <p>The Comprehensive Industry document series on Sponge Iron Industry published by Central Pollution Control Board, Ministry of Environment and Forests in March 2007 clearly states that "The hot DRI gases contains huge amount of fine dust comprising oxides and unburnt carbon and toxic carbon monoxide. It needs treatment before discharging into the atmosphere." (Refer page 69 of the report. Also page 112-states that CO volume not to exceed 1% by volume.(which is as per Environmental standards)</p> <p>The same was confirmed with the review of GSR notification 414E published by ministry of environment and forest, dated 30<sup>th</sup> May 2008 (which was applicable at the time of completion of baseline study) confirms that the limit for CO for sponge iron plants is as mentioned above  <a href="http://www.envfor.nic.in/legis/ep/414E.pdf">http://www.envfor.nic.in/legis/ep/414E.pdf</a></p>
W2	N		<p>In absence of the project activity, the project proponent would have flared (<i>i.e.</i> releasing after complete combustion) the waste gas into the atmosphere. In such a situation, the entire heat energy content of the waste gas would have been lost. This was the current practice followed at the facility of VSIPL as confirmed from the site visit and also the 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.</p>
W3	Y	No Potential purchaser for waste gas in vicinity	<p>There is no potential purchaser for the waste gas in the vicinity. The same was verified during the site visit and through interviews conducted with project proponent. The same was cross verified from <a href="http://purulia.gov.in/industry/dist_industry.html">http://purulia.gov.in/industry/dist_industry.html</a> which indicates that there mainly sponge iron units located in and around the region and no other potential purchaser for waste gas is present at the project location.</p> <p>Therefore this alternative can not be considered as a realistic and credible alternative for the project proponent in absence of the project activity.</p>
W4	Y	No thermal demand at the facility and meeting power demand would have faced similar investment risks as of the project activity	<p>In absence of the project activity, the heat content of the waste gas could have been utilized for generation of electrical energy. However the energy demand in case of 2 DRI Kilns would have been very less approximately 0.9 MW considering 0.45 MW power demand per kiln (cross verified from Letter from ARK Engineering and Consultancy to M/s Vision Sponge Iron Private Limited giving the power requirements of the different facilities dated 13/04/2007) and hence would not have opted to invest in this alternative.</p>

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation of final result
			Also the waste heat recovery based electricity generation would have faced all investment related risks as of the project activity and hence cannot be considered as a realistic and feasible baseline alternative
W5	Y	Partial utilization of DRI kilns gas for generation of captive electricity	Utilization of the DRI kiln gas for power generation is exposed to all the investment risks as the project activity is facing. Therefore partial utilization DRI kiln gas for generation of captive electricity can not be considered as a realistic and credible alternative for the project activity under consideration
W6	Y	Project activity involves captive electricity generation without any export to grid	<p>The amount of waste gas generated through the 2 DRI Kilns and the capture of the same for electricity generation would have been used to meet the partial in-house demand and therefore no surplus electricity would have been available with PP for export to grid.</p> <p>The same is verified through</p> <ol style="list-style-type: none"> <li>1. Letter from M/s Vision Sponge Iron Private Limited to ARK Engineering &amp; Consultancy enquiring about the power requirements of the different facilities dated 11/04/2007</li> <li>2. Letter from ARK Engineering and Consultancy to M/s Vision Sponge Iron Private Limited giving the power requirements of the different facilities dated 13/04/2007</li> </ol> <p>Therefore this alternative can not be considered as a realistic and credible alternative for the project activity under consideration</p> <p>Moreover this alternative would have faced similar investment related risk as of the project activity and hence cannot be considered as the baseline alternative</p>

#### Use of Waste Energy for new facility consisting of 3 DRI Kilns

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation of final result
W1	Y	Local regulations	The legal requirements are same as those of the existing facility.
W2	N		<p>The condition would not have changed for the new facilities.</p> <p>In absence of the project activity, the project proponent would have flared (i.e. releasing after complete combustion) the waste gas into the atmosphere. In such a situation, the entire heat energy content of the waste gas would have been lost. This was the current practice followed at the facility of VSIPL as confirmed from the site visit and also the 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.</p>
W3	Y	No Potential purchaser for waste gas in vicinity	<p>The conditions would not have changed for the new DRI, since the conditions existing would have been continued. It was confirmed that there is no potential purchaser for the waste gas in the vicinity. The same was verified during the site visit and through interviews conducted with project proponent. The same was cross verified from <a href="http://purulia.gov.in/industry/dist_industry.html">http://purulia.gov.in/industry/dist_industry.html</a> which indicates that there mainly sponge iron units located</p>

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation of final result
			in and around the region and no other potential purchaser for waste gas is present at the project location. Therefore this alternative can not be considered as a realistic and credible alternative for the project proponent in absence of the project activity.
W4	Y	No thermal demand at the facility	There is no unit in the manufacturing facility of VSIPL where the waste gas can be used for meeting thermal energy demand. The same is confirmed through the review of Detailed Project Report prepared for the project by ARK Engineering & Consultancy and site visit.
W5	Y	Partial utilization of DRI kilns gas for generation of captive electricity	Utilization of the DRI kiln gas for power generation is exposed to all the investment risks as the project activity is facing. Therefore partial utilization DRI kiln gas for generation of captive electricity can not be considered as a realistic and credible alternative for the project activity under consideration
W6	Y	Project activity involves captive electricity generation without any export to grid	<p>The project activity aims at utilization of the DRI kiln gas for power generation which will entirely be consumed in-house. The total power requirement of the facility is 16 MW and out of which 8.4 MW will be sourced from WHRB and 6.6 MW from AFBC and the remaining power will be sourced from the Damodar Valley Corporation as per the agreement dated 5<sup>th</sup> October 2005 which is already in place. Hence there will be no surplus electricity is available to export to the grid.</p> <p>The same is verified through</p> <ol style="list-style-type: none"> <li>1. Letter from M/s Vision Sponge Iron Private Limited to ARK Engineering &amp; Consultancy enquiring about the power requirements of the different facilities dated 11/04/2007</li> <li>2. Letter from ARK Engineering and Consultancy to M/s Vision Sponge Iron Private Limited giving the power requirements of the different facilities dated 13/04/2007</li> <li>3. Letter from ARK Engineering and Consultancy suggesting project options (15 MW AFBC based power generation and 6.6 MW AFBC+8.4 MW WHRB based power generation) to M/s Vision Sponge Iron Private Limited to cater their power requirements dated 24/04/2007.</li> </ol> <p>There will not be any exportable electricity in the project scenario. Therefore this alternative can not be considered as a realistic and credible alternative for the project activity under consideration.</p> <p>Moreover this alternative would have faced similar investment related risk as of the project activity and hence cannot be considered as the baseline alternative</p>



For Power Generation (combined for existing and new facility):

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation of final result
P1	Y	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 gas for generation of power. In absence of CDM revenue, this alternative can not be considered as a realistic and credible alternative for the project proponent.
P2	Y	No steam requirement at the project site	The project proponent does not have any requirement for steam. The same was verified during the site visit. Therefore installation of an onsite new fossil fuel fired cogeneration plant in absence of the project activity is not a realistic and credible alternative for the project proponent.
P3	Y	No steam requirement at the project site	The project proponent does not have any requirement for steam. Therefore installation of an onsite new renewable energy based cogeneration plant in absence of the project activity is not a realistic and credible alternative for the project proponent.
P4	N		<p>The credibility of this alternative is assessed by following steps</p> <ol style="list-style-type: none"> <li>1. Plant's requirement- the increase in energy demand can be met through this alternative – the same has been verified from the letter from ARK Engineering and Consultancy suggesting two project options to M/s Vision Sponge Iron Private Limited to cater their power requirements dated 24/04/2007 which includes coal based power generation as one alternative</li> <li>2. Along with the project activity 6.6 MW AFBC will be installed (cross verified from the Detailed project report) which indicates that this alternative is a credible baseline alternative and also in compliance with all regulations</li> <li>3. the extract of board minutes dated 3<sup>rd</sup> May 2007 also had considered a option of implementing a coal based power plant</li> <li>4. Fuel availability - Coal is available in abundance in and around the region and there is no supply constraint for the same. The same is confirmed through <ul style="list-style-type: none"> <li>▪ <a href="http://www.mapsofindia.com/maps/minerals/coal-mines-map.html">http://www.mapsofindia.com/maps/minerals/coal-mines-map.html</a></li> <li>▪ <a href="http://www.mapsofindia.com/business/industries/coal-energy/india-coal-deposits.html">http://www.mapsofindia.com/business/industries/coal-energy/india-coal-deposits.html</a></li> <li>▪ <a href="http://www.mapsofindia.com/maps/west-bengal/westbengal-district-map.gif">http://www.mapsofindia.com/maps/west-bengal/westbengal-district-map.gif</a></li> </ul> </li> </ol> <p>The map clearly shows the locations Raniganj, Jharia and Bokaro to be very close to the project site .</p> <p>The other fuel that Char which would be used as a fuel mix with coal are available in sufficient quantity at the facility as generated as a waste from the DRI operation.</p>
P5	Y	Limited availability of renewable energy sources  Output not similar to that of project activity.	<p>The different renewable energy sources that have considered are Hydro, Biomass, and Wind.</p> <ol style="list-style-type: none"> <li>1) There is limited availability of renewable resources (biomass and wind) in and around Purulia, West Bengal where the project activity plant is situated. The same is verified through <a href="http://mnes.nic.in/annualreport/2007_2008_English/Chapter%205/chapter%205_1.htm">http://mnes.nic.in/annualreport/2007_2008_English/Chapter%205/chapter%205_1.htm</a></li> <li>2) The wind power density map clearly demonstrates that there is no potential for wind based</li> </ol>

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation of final result
			<p>power generation at the project location.  <a href="http://mnes.nic.in/booklets/Book6-e.pdf">http://mnes.nic.in/booklets/Book6-e.pdf</a></p> <p>Although increase in the energy demand of the facility can be met through this alternative, wind energy being a seasonal power generation cannot meet the continuous energy requirements of the plant. Furthermore, hydro is not a realistic alternative as there is no perennial river in the nearby areas. Moreover renewable resource based power generating stations typically used for peak load services and not for base load services which are important for sponge iron manufacturing.</p>
P6	N		<p>The credibility of the alternative is checked as below:</p> <ol style="list-style-type: none"> <li>1) The project proponent already has a agreement with the Damodar Valley Corporation for contract demand of 3 MW dated 5th October 2005</li> <li>2) the extract of board minutes dated 3<sup>rd</sup> May 2007 also had considered this option to meet the power requirements</li> </ol> <p>And 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 imported from DVC which is part of the thermal power dominated NEWNE grid and therefore would have been generated at power plants connected to the grid.</p>
P7	Y	The project does not involve any efficiency improvement in power generation	This alternative faces the investment related risks and barriers associated with the project activity. 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.
P8	Y	The project does not involve any cogeneration	The project activity is not a cogeneration activity. The same is cross verified from the Detail Project Report (DPR) prepared by ARK Engineering & Consultancy (appointed power consultant for the project activity)
P9	Y	No existing power generation equipment at project site	There is no existing power generating equipment available with the project proponent <i>i.e.</i> Vision Sponge Iron Private Limited. And the same is cross verified by the validation team during the site visit and interviews conducted with the plant employees of VSIPL.
P10	Y	No existing power generation equipment at project site	There is no existing power generating equipment available with the project proponent <i>i.e.</i> Vision Sponge Iron Private Limited. And the same is cross verified by the validation team during the site visit and interviews conducted with the plant employees of VSIPL.
P11	Y	No existing power generation equipment at project site	There is no existing power generating equipment available with the project proponent <i>i.e.</i> Vision Sponge Iron Private Limited. And the same is cross verified by the validation team during the site visit and interviews conducted with the plant employees of VSIPL.