Validation Report

Report for:
Mukand Limited

Validation of CDM project for
Power generation by utilizing Blast Furnace Gas at Mukand Limited, Ginigera, Karnataka

LRQA Reference	:	CDM-MUM-0061451 Version 02.7
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1 Executive Summary

Lloyd's Register Quality Assurance Limited has been contracted by Mukand Limited, the project participant (PP), to undertake validation of the proposed project activity "Power generation by utilizing Blast Furnace Gas at Mukand Limited, Ginigera, Karnataka". The validation has been performed through a process of document review based on the project design document, Version 01 dated 28/05/2008 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 implemented by Mukand Limited involves utilisation of surplus blast furnace gas from mini blast furnace (MBF) for power generation. The blast furnace gas after meeting the requirements in the hot blast stoves will be fired in a dual fuel fired boiler along with furnace oil to generate high pressure steam which will subsequently used for power generation through a 15 MW steam turbine generator. The net electricity after meeting the auxiliary requirements will be consumed for captive purpose in the integrated steel plant. This electricity would have been generated from the grid connected power plants; hence resulting in emission reductions.

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. A risk based approach was taken to conduct the validation and corrective action requests (CARs) and clarifications (CLs) were raised for relevant actions by the PP.

The validation team has found through the validation process 19 CARs and 04 CLs. The PP has taken actions and submitted to LRQA the revised PDD and further evidence related to project conception, technology, and finance. The validation team is of the opinion that the proposed project activity as described in the project design document Version 07 dated 27/082011 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 "Power generation by utilizing Blast Furnace Gas at Mukand Limited, Ginigera, Karnataka" to the CDM Executive Board as a CDM project activity.

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Abbreviations

BE	Baseline emissions
BFG	Blast furnace gas
BM	Build Margin
CARs	Corrective action requests
CAPM	Capital Asset Pricing Model
CDM	Clean development mechanism
CDM-EB	Executive board of clean development mechanism
CDM M&P	Modalities and procedures for a clean development mechanism
CDM VVM	CDM Validation and Verification Manual
CERs	Certified emission reductions
CERC	Central Electricity Regulatory Commission
CLs	Clarification requests
COP/MOP	Conference of the Parties serving as meeting of the Parties to the Kyoto Protocol
CO	Carbon monoxide
CM	Combined margin
DNA	Designated national authority
DOE	Designated operational entity
EF	Emission factor
EIA	Environmental impact assessment
ERPA	Emissions reduction purchase agreement
FAR	Forward action requests
FO	Furnace oil
GCP	Gas cleaning plant
GHG	Greenhouse gas
GSP	Global stakeholders' consultation process
IPCC	Intergovernmental panel on climate change
IRR	Internal rate of return
INR	Indian Rupees
KP	Kyoto Protocol of the United Nations Framework Convention on Climate Change
kW / kWh	Kilowatt / Kilowatt hour
KSERC	Karnataka State Electricity Regulatory Commission
KSPCB	Karnataka State Pollution Control Board
KSL	Kalyani Steels Limited
LE	Leakage emissions
LoA	Letter of approval
LR	Lloyd's Register
LRQA	Lloyd's Register Quality Assurance Limited
LPG	Liquid petroleum gas
MBF	Mini blast furnace
ML	Mukand Limited
MW / MWh	Mega watt / Mega watt hour
MoEF	Ministry of Environment and Forests
NCV	Net calorific value
NGO	Non governmental organization

ODA	Official development aid
OM	Operating margin
PDD	Project design document
PE	Project emissions
PP	Project participant
PLC	Programmable logic control
RBI	Reserve Bank of India
STG	Steam turbine generator
tCO_2e	Tonnes of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
WACC	Weighted average cost of capital
WECM	Waste Energy Carrying Medium

2 Introduction

The project participant (PP) represented by Mukand Limited has contracted with Lloyd's Register Quality Assurance Limited (LRQA) to undertake validation of the proposed project activity "Power generation by utilizing Blast Furnace Gas at Mukand Limited, Ginigera, Karnataka". This report summarizes the findings of the validation process that has been conducted on the validation requirements of the CDM.

The validation has been undertaken by the team formed of the qualified personnel of LRQA as follows:

Ketan S. Deshmukh	LRQA Asia	Team leader CDM lead validator
Imran Ustad	LRQA Ltd. India	Team member CDM validator
A V Shivaramakrishnan	LRQA Ltd. India	Sector expert (Industry)
P R N Rao	LRQA Ltd. India	Team member
Avinash Lonkar	External expert	Sector expert (Waste energy)
Prabodha C Acharya	LRQA Ltd. India	Technical reviewer, Sector expert (Industry)
Stewart Niu	LRQA China	Sector expert to technical review (Waste energy)
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 competence criteria for a Designated Operational Entity under CDM. LRQA 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 Article 12 of the Kyoto Protocol, the CDM M&P, the present annex, subsequent decisions made by the COP/MOP and CDM-EB, and other rules applicable to the proposed project activity including the host country's legislation and its specific requirements for sustainable development. The validation follows the requirements of the current version of the CDM validation and verification manual (CDM VVM) to ensure the quality and consistency of the validation work and the report.

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 and relevant decisions of the COP/MOP and the CDM-EB. LRQA follows a risk-based approach in the validation focusing on the identification of significant risks for project implementation and generation of CERs. 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 decision maker's review by LRQA Ltd.

2.3 GHG Project Description

The project activity involves utilization of surplus (after partial consumption in the hot blast stoves for supplying hot blast for MBF-3 operation) blast furnace gas from a 350 m^3 Mini Blast Furnace (MBF) for electricity generation. The project activity proposes to install a dual fuel fired (blast furnace gas and Furnace Oil) boiler so as to utilise the waste blast furnace gas from the existing 350m^3 MBF for power generation. The calorific value of the surplus blast furnace gas emanating from the MBF will be used for generating steam which will be passed through a 15 MW steam turbine generator for electricity generation. In absence of the project activity, the equivalent amount of electricity would have been sourced from the southern regional grid of India so as to meet the requirement of integrated steel plant. Thus the project activity is being implemented to replace an equivalent amount of electricity generation from southern grid which is predominantly fossil fuel based, thereby reducing Greenhouse Gas (GHG) emissions.

The project activity will result in emission reductions of 71,581 tonnes of CO_2e per annum.

3 Methodology

3.1 Review of documents

The validation is performed primarily based on the review of the project design document (PDD) and the other supporting documentation.

The PDD Version 01 dated 28/05/2008 was initially reviewed. LRQA requested the PP to present supporting information and documents relating to the project design and such additional information and documents were also reviewed by LRQA.

Through the process of the validation, the PDD and the supporting documents of the same were evaluated to confirm the actions taken by the PP to the CARs and CLs issued by LRQA. The documents reviewed by LRQA are listed in Appendix B. LRQA reviewed the revised version of the PDD Version 07 dated 27/08/2011 to confirm that all changes agreed had been incorporated.

3.2 Follow-up interviews

Follow-up interviews with the stakeholders and a field survey were conducted as detailed in the schedule as below:

17-18	December, 2008	Mukand Limited, Hospet, District Koppal, Karnataka
19	December, 2008	Meeting with villagers, Hospet, Koppal Road, District Koppal, Karnataka
31	March, 2009	Meeting with villagers, Hospet, Koppal Road, District Koppal, Karnataka
01	April, 2009	Mukand Limited, Hospet, District Koppal, Karnataka
16	Sept, 2009	Mukand Limited, Kalwe office, Thane
04	February, 2010	Mukand Limited, Kalwe office, Thane

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

3.3 Resolution of clarification and corrective action requests

LRQA applies the risk based approach aimed at focusing on high risk issues to the validation results whilst not omitting any part of the mandatory processes.

Findings identified in the process are indicated under the titles corrective action requests (CARs) and clarification requests (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:

<u>Corrective action request (CAR):</u>

- the project participants have made mistakes that will influence the

ability of the project activity to achieve real, measurable additional emission reductions
- the CDM requirements have not been met, or
- there is a risk that emission reductions cannot be monitored or calculated.

Clarification request (CL):
- information is insufficient or not sufficiently clear to determine whether the applicable CDM requirements have been met.

FARs are 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.

CARs and CLs are to be resolved or closed out if the PP modifies the project design, rectifies the PDD or provides adequate additional explanations or evidence that satisfies the concerns. If this is not completed, the project activity cannot be recommended for registration to the CDM Executive Board.

3.4 Internal quality control

A 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 to the PP 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 01.2 [EB55 Annex 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 project has currently been proposed as a unilateral CDM project and the Annex I Party has not yet been identified. In line with the provision of paragraph 57 of the 18th meeting of the CDM-EB, registration of a project activity can take place without an Annex I Party being involved at the stage of registration.

The host Party of the proposed project is India. India ratified the Kyoto Protocol on 26 August 2002. The Designated National Authority (DNA) is National Clean Development Mechanism Authority (NCDMA).

The information of the DNA has been confirmed by the validation team against the relevant information on the UNFCCC CDM website (http://cdm.unfccc.int/DNA/index.html).

A letter of approval (LoA) from the host Party's DNA dated 03 September 2008 was made available by the PP. The validation team reviewed the LoA presented by the PP against the requirements in 'Clarification on elements of a written approval' and confirmed that the LoA contain the elements requested by the CDM-EB, including:

- confirmation of the Party's ratification to the Kyoto Protocol
- voluntary participation
- the project activity's contribution to sustainable development of the country (host Party), and
- the precise title of the CDM project activity of the final PDD referenced.

The LoA was noted as unconditional with respect of the above elements. The LoA was also compared with those of other approval cases issued by the DNA, on UNFCCC website. The team confirmed the authenticity of the letter issued.

In addition, LRQA accessed the website of India DNA at http://cdmindia.nic.in/ and through project search confirmed the approval status of the project activity. The website provides the PCN that was sent to NCDMA at the time of seeking the Letter of Approval. The PCN can be accessed through the following weblink:

http://cdmindia.nic.in/cdmindia/projects/PCN_1017_08.pdf.

Validation team confirmed that Mukand Limited is private entity having its registered office in India. The contact details of the PPs are correctly provided in Annex 1 of the PDD.

Participation in the project activity of the PP has been authorized, as confirmed in the LoA issued by the DNA of the Party concerned. The team confirmed that no entity other than the authorized entity is indicated as project participant in the PDD.

The Modalities of Communication (MoC) was signed on 08/04/2010 and

submitted to LRQA as per the guidance adopted in the 45th meeting of the CDM-EB. Mukand Limited is the project participant as indicated in the Letter of Approval and in Section A.3 of the PDD. Mr. Virendra K Mital, Director, Mukand Limited is the same person indicated as the representative of the entity in Annex 1 of the PDD. The contact details of the entity were compared with Annex 1 of the PDD and the correctness was confirmed by the validation team.

However, CL 01 was raised as section A.3 of the PDD did not explicitly indicate if Mukand Ltd is a private or a public entity. PP submitted the revised PDD updating section A.3 of the PDD indicating Mukand Ltd as a private entity. LRQA confirmed the private status of Mukand from the annual reports of Mukand Ltd. The finding was therefore closed.

4.2 General description

Project design document

The PDD was checked and confirmed as complete against 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]. A valid form of the CDM-PDD version 03 [EB25 Annex 15] is used that is the current form as available on the CDM website.

Project description

Mukand Limited and Kalyani Steels Limited have entered into a strategic alliance in the name of Hospet Steels Limited for production of alloy and special steels[1]. The Hospet Steels plant consists of iron making division, steel making division and rolling mill division and is located at Ginigera in Koppal district of Karnataka State. Hospet Steels Limited has three mini blast furnace (MBF) of which two are of 250 m^3 (MBF-1 and MBF-2) and one is of 350m^3 (MBF-3) capacity. The project activity implemented by Mukand Limited involves utilisation of surplus blast furnace gas from MBF-3 for power generation[2].

MBF-3 has a working volume of 350m^3 and is capable of producing 700 tonnes of hot metal per day. Under normal operating conditions the MBF-3 can operate for 345 days/annum and generates an average of 82,530 Nm^3/hour of blast furnace gas. About 23% of the blast furnace gas is consumed in the hot blast stoves for the purpose of supplying hot blast for the MBF-3 operations. The project activity intends to utilise the surplus blast furnace gas for power generation which would have been flared to the atmosphere in absence of the project activity.

The PP intends to install a dual fuel fired boiler capable of firing blast furnace gas as well as furnace oil for generating 55 tonnes per hour (TPH) of steam at pressure of 67 kg/cm^2, which will then be passed through a steam turbine generator having an installed capacity of 15 MW. The net electricity estimated to be 94,779 MWh/annum after meeting the auxiliary requirements will be consumed for captive purpose in the integrated steel plant.

The boiler has been provided by ISGEC John Thompson, while the steam turbine generator is provided by Qingdao Jieneng Power Station

[1] http://www.hospetsteels.in/

[2] Kalyani Steels Limited has implemented a CDM project (ref no. 0427) for power generation by utilising surplus blast furnace gases from MBF-1 and MBF-2. Refer http://cdm.unfccc.int/Projects/DB/BVQI1146639607.87/view

Engineering Co. Ltd. The technical details of the boiler, steam turbine and generator have been verified from the technical specifications provided by the manufacturers.

The net electricity from the project activity would have been generated from the grid connected power plants which are pre-dominantly fossil fuel based. Hence, the project activity will replace equivalent amount of grid based electricity so as to result in emission reductions estimated at 71,581 tCO2e per annum for fixed crediting period of 10 years. The project activity is in the installation and commissioning stage.

The accuracy and completeness of the project description was validated by document review including technical drawings, equipment supply agreements, interviews, field survey and the relevance was confirmed by the validation team.

Sustainable development

The project activity supports the sustainable development criteria of the host country. The validation team reviewed the four indicators for sustainable development defined by NCDMA: - environment, economic, social and technology.

The NCDMA has specified the criteria for each of these elements as under:

Social well being: The CDM project activity should lead to alleviation of poverty by generating additional employment, removal of social disparities and contribution to provision of basic amenities to people leading to improvement in quality of life of people.

Economic well being: The CDM project activity should bring in additional investment consistent with the needs of the people.

Environmental well being: This should include a discussion of impact of the project activity on resource sustainability and resource degradation, if any, due to proposed activity; bio-diversity friendliness; impact on human health; reduction of levels of pollution in general;

Technological well being: The CDM project activity should lead to transfer of environmentally safe and sound technologies that are comparable to best practices in order to assist in upgradation of the technological base. The transfer of technology can be within the country as well from other developing countries also.

Justification in the PDD with respect of each of these indicators was considered appropriate.

NCDMA has confirmed the contribution of the project activity to the sustainable development of the host Party in the LoA issued.

Public funding

Based on the review of financial information furnished by the PP, it has been confirmed that the project activity is funded solely through equity. LRQA therefore confirms that there is no funding from an Official Development Aid (ODA).

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

CAR 01, CAR 02
Project description under section A.2 and A.4.3 of the PDD did not describe the pre-project and project scenarios. Hence CAR 01 and CAR 02 were raised. PP submitted the revised PDD which included the scenarios as required by guidelines for completing CDM-PDD. LRQA reviewed the site layout diagram, technical specifications performed site visit to confirm that the surplus blast furnace gas would have been flared in the absence of the project activity, while the electricity would have been sourced from the southern regional grid system. Hence CAR 01 and CAR 02 were closed.

4.3 Baseline methodology

Application of baseline and monitoring methodology

The project applies the approved consolidated baseline and monitoring methodology ACM0012 / Version 3.2 - "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects", which is the current version effective from 16th August 2008. The period of the global stakeholders' consultation process (GSP) for the project activity was held from 10th July 2008 to 08th August 2008 and at the time of the commencement of the validation the Version 2.0 of ACM0012 was valid. Since the project activity applying ACM0012 version 2.0 was allowed for requesting registration until 15th April 2009 23:59 GMT, the PP has applied the latest version i.e. version 03.2 of ACM0012. In accordance with paragraph 6 of "Procedures for processing and reporting on validation of CDM project activities" published in EB 50 Annex 48, the revised PDD using version 03.2 of ACM0012 does not require republishing for global stakeholder consultation prior to the submission of request for registration.

The methodology refers to the latest version of "Tool for the demonstration and assessment of additionality" (Additionality Tool) and "Tool to calculate the emission factor for an electricity system". The

current versions of the Additionality Tool i.e. Version 05.2 has been applied.

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 surplus blast furnace gas from the MBF-3 would be used for generation of electricity, which would have been flared in absence of the project activity. This was confirmed from the on-site check conducted during the site visit in April 2009 that the blast furnace gas from the MBF-3 was being flared to atmosphere.

- 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 facility is higher than the electricity generation capacity of the project activity, which was confirmed from review of total power requirement of the plant.
- The generated electricity is meant for captive purpose which was confirmed from interviews and the power requirement of the plant. Captive consumption was confirmed as being allowed through discussions with the officials of the grid company.
- Energy is generated by ML, while the industrial facility (MBF-3) is owned by KSL. ML and KSL have entered into an agreement for usage of blast furnace gases wherein both the parties have agreed that the blast furnace gases from MBF-3 shall be exclusively used by ML for the proposed 15 MW power plant (project activity) referring the strategic alliance agreement[3].
- In the host country, there is no regulation that constrains the industrial facility from using fossil fuel
- Project activity intends to utilise the surplus blast furnace gas from the existing MBF-3 for the purpose of power generation.
- The emission reductions from the project activity would be claimed by the generator of the electrical energy using waste energy of MBF-3 i.e Mukand Limited.
- Energy is not exported to other facilities. The entire electricity will be used in the integrated steel plant of Mukand Limited and Kalyani Steels Limited for meeting its in-house power requirements and hence there will not be any export to other facilities.
- Mukand Limited has not been involved in power generation prior to implementation of the project activity. The power requirements were being met from the grid. This was confirmed from the electricity bills for the period prior to implementation of the

[3] The 'agreement for usage of off-gases' signed between Mukand Limited and Kalyani Steels Limited on 30th September 2009 is confidential in nature. This agreement was sighted by LRQA during validation.

project activity. Moreover, validation team has confirmed that the equipments installed under the project activity have a lifetime greater than the crediting period.

- Waste energy that is released under abnormal operation (emergencies, shut down) of the plant shall not be accounted for since only the blast furnace gas consumption will be monitored after the flaring system and prior to firing into the boiler. Hence validation team confirmed that the blast furnace gas flared during abnormal operations will not be accounted for.

Through on-site visit and sectoral expertise, LRQA confirmed that the project activity is not implemented in a single cycle power plant, rather uses the surplus waste gas liberated from the blast furnace for power generation. Hence ACM0012 version 3.2 is applicable for the project activity.

The waste energy (i.e the calorific energy from the surplus blast furnace gas from MBF-3) utilized in the project activity was flared into the atmosphere in the absence of the project activity. The validation team initially raised a CAR 03 on this element, but closed this on basis of the review of subsequent actions including a repeat site visit,

CAR 03
Although the Applicability of ACM0012 ver 03.2 requires that the WECM is flared or released into the atmosphere in the absence of the project activity at the facility, LRQA noted during the site visit that the blast furnace gases from MBF-3 were partially utilised in another registered project (ref no. 0427). An interconnecting BF pipeline from MBF-3 leading to the registered project activity was sighted. Hence CAR 03 was raised.

PP presented the blast furnace gas usage data for the existing project activity. LRQA analysed the BF gas usage data and could confirm that the BF gas from MBF-1 and MBF-2 at normal operations were sufficient to cater the demands of the present project activity (ref no. 0427) with a small portion of BF gases being flared. For this LRQA analysed the blast furnace gas consumption data for one year (2007 when only MBF-1 and MBF-2 were in operation). LRQA confirmed that under normal operating conditions, the surplus blast furnace gas from MBF-1 and MBF-2 were sufficient to cater the needs to the existing power plant. Also, at the time of investment decision making, utilisation of MBF-3 waste gas in the existing power plant (9 MW) was not envisaged and the decision making clearly presented the need of a new power plant of 15 MW capacity. LRQA confirmed that the connection to the power plant of project 0427 was removed through a second site visit held on 31/03/09 and 01/04/09, while the project activity was still under implementation.

Further, the PP submitted a letter jointly signed by KSL (owner of MBF-3 that producing waste energy) and ML (generator of energy using waste energy for 15 MW power plant) confirming the BF gas sharing agreement between them. The agreement dated 30th September 2009 titled, "Agreement for usage of Off-gases" details that the waste gas from MBF-1 and MBF-2 will be used exclusively by KSL for power generation while the BF gas from MBF-3 will be exclusively used by ML for the 15 MW power plant.

Hence, LRQA confirmed that the Waste Energy Carrying Medium i.e. surplus blast furnace gas would have been flared in the absence of the project activity.

Project boundary

The physical boundary of the project activity covers.

1. The industrial facility where waste energy is generated i.e MBF-3 along with the ducting system for transportation of blast furnace gas to the dual fuel fired boiler in the power plant;
2. The facility where process heat in the element process (steam) is generated i.e the dual fuel fired boiler and steam turbine generator 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 integrated steel plant of Mukand Limited and Kalyani Steels Limited where the electricity will be consumed.

The project boundary has been validated through documentation review of site layout of the power plant, interviews with the operational staff and field survey. Through the processes taken, the validation team confirmed that the identified project boundary, selected sources and gases were justified for the project activity and meets the requirements of the approved methodology.

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

Though the project activity has provision for supplementary electricity consumption for auxiliary stat-up as well as consumption of LPG in pilot burner of boiler, the project boundary does not indicate the same. Hence, CAR 04 was raised. PP submitted the revised PDD, updating the project boundary diagram so as to include the provision for supplementary grid electricity consumption, LPG and FO consumption in pilot burner. The diagram also presents the metering locations as required by the guidelines for completing CDM-PDD version 07. Therefore the finding was closed.

LRQA confirmed from document review of the environmental consent that the MBF-3 is owned by Kalyani Steels Ltd. which is the generator of the waste gas. However, the PDD section B.3 states that "The source of waste gas (BF gas), is the outlet of the Mini Blast Furnace of the Steel Plant of Mukand Ltd. Thus Mukand Ltd. is the generator of waste energy." Hence CAR 05 was raised. LRQA confirmed the existence of a gas sharing agreement between Mukand Ltd. and Kalyani Steels Ltd. as per which the BF gas from MBF-1 and MBF-2 will be exclusively used by Kalyani Steels Ltd. for power generation while the BF gas from MBF-3 will be exclusively used by Mukand Ltd. for the 15 MW power plant. Hence, CAR was closed.

Table under section B.3 of PDD version 01 indicates inclusion of CO_2 emissions resulting from fossil fuel consumption in boiler for thermal energy, while justification against the same states boiler does not exist in baseline scenario. Hence CL 02 was raised. PP clarified it to be an editorial mistake and that there was no boiler in the baseline scenario. Hence CL 02 was closed.

Baseline scenario

The validation team assessed the requirement taking the steps below.

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.

Evaluation of potential alternatives for use of waste energy:

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation
W1	Y	Local regulations	The blast furnace gas emanating from the MBF-3 contains high percentage of Carbon Monoxide that cannot be directly vented into the atmosphere without combustion. LRQA confirmed the same from the 'Consent for establishment' dated 22/10/2007 for expansion of production capacity by installation of MBF-3. The consent specifies the Carbon Monoxide (CO) concentration in the exhaust waste gas that can be released.
W2	N		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 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.
W3	Y	No Potential purchaser for waste gas in vicinity	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. Therefore this alternative can not be considered as a realistic and credible alternative for the project proponent in absence of the project activity.
W4	N		LRQA confirmed that the existing reheating furnace in the integrated steel plant will cater to the expansion of steel plant, hence the waste energy cannot be used for meeting the thermal energy demand in the steel plant. Besides the reheating furnace having originally been designed for furnace oil will not be suitable for BFG. The calorific value of furnace oil being 14 times that of BFG means that a very large reheating furnace would be required. However, the waste energy could have been used for meeting the captive electrical demand. Therefore this alternative has been considered for further evaluation.
W5	Y	Partial utilization of	Utilization of the blast furnace gas for power generation is exposed to all the

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation
		blast furnace gas for generation of electricity would have faced similar investment risks as of the project activity	investment risks as the project activity is facing. Therefore partial utilization blast furnace 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	The amount of blast furnace gas generated through the MBF-3 and utilisation of the same for electricity generation would have been used to meet the partial in-house demand and therefore no surplus electricity will be available with PP for export to grid. The same is verified from the power requirement for the steel plant considering the connected loads. Therefore this alternative can not be considered as a realistic and credible alternative for the project activity under consideration LRQA further confirmed that the cost price of electricity is higher than the supply price received from the grid in the event of export. Therefore, it makes good sense to supply electricity for captive consumption rather than sale (export) to the grid.

Evaluation of potential alternatives for power generation:

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation
P1	N		In absence of the project activity, the project proponent could have utilized the heat content of the surplus blast furnace gas for generation of power. Therefore alternative P1 has been considered for further evaluation.
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 alternative P2 is not a realistic and credible alternative for the project proponent.
P3	Y	No steam requirement at the	The project proponent does not have any requirement for steam. Therefore alternative P3 is not a realistic and credible alternative for the

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation
		project site	project proponent.
P4	N		In absence of the project activity, the PP could have installed a new fossil fuel based captive power plant. Indian regulations do not constrain the use of fossil fuel for captive power generation purposes. Hence, the alternative P4 may be a potential baseline and therefore has been considered for further evaluation.
P5	Y	Limited availability of renewable energy sources Output not similar to that of project activity.	Although increase in the energy demand of the facility can be met through this alternative, wind, hydro and solar energy cannot meet the continuous energy requirements of the plant due to their seasonal nature. Given the constraints of Biomass availability, operation of the biomass power plant to deliver consistent and stable power supply is not assured. The validation team also concluded that given that 94% of the solid wastes being dumped in open landfills does not make it a credible option to be considered for electricity generation. Moreover renewable resource based power generating stations typically used for peak load services and not for base load services which are important for iron and steel industry. Therefore alternative P5 cannot be considered as a realistic and credible alternative for the project activity.
P6	N		Currently, Mukand Limited is importing electricity from the southern grid system through Karnataka State Electricity Board (KSEB). 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 KSEB which is part of the thermal power dominated southern grid and therefore would have been generated at power plants connected to the grid. LRQA validated the same through document review of the electricity bills and the electricity consumption during the pre-project scenario.
P7	Y	The project represents captive generation with lower efficiency	This alternative faces the investment related risks and barriers associated with the project activity. Section B.5 details the additionality of the project activity. It is seen that if the project activity is not economically feasible, it follows that a project

Baseline alternatives identified	Eliminated	Reason for elimination	Explanation
		than the project activity)	activity with lower efficiency would also not be economically feasible. 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 confirmed from the technical specifications of the steam turbine generator. Nor is there any demand for thermal energy in the steel plant.
P9	Y	No existing power generation equipment at project site	There is no existing power generating equipment available with Mukand Limited. LRQA confirmed the same during the site visit and interviews conducted with the plant employees of Mukand Limited.
P10	Y	No existing power generation equipment at project site	There is no existing power generating equipment available with Mukand Limited. LRQA confirmed the same during the site visit and interviews conducted with the plant employees of Mukand Limited.
P11	Y	No existing power generation equipment at project site	There is no existing power generating equipment available with Mukand Limited. LRQA confirmed the same during the site visit and interviews conducted with the plant employees of Mukand Limited.

Therefore, the plausible baseline alternatives for the project activity are as below:

Alternative 1: W2 and P4 wherein Waste Energy Carrying Medium (WECM) i.e. surplus blast furnace gas is released to the atmosphere after flaring and the electricity is sourced from on-site fossil fuel based plant

Alternative 2: W2 and P6 wherein Waste Energy Carrying Medium (WECM) i.e. surplus blast furnace gas is released to the atmosphere after flaring and the electricity is sourced from gird-connected power plants and

Alternative 3: W4 and P1 wherein Waste Energy is used for meeting energy demand without seeking CDM benefits

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

Alternative 1: W2 and P4 wherein Waste Energy Carrying Medium (WECM) i.e. surplus blast furnace gas is released to the atmosphere after flaring and the electricity is sourced from on-site fossil fuel based plant.

The PP could have sourced electricity by setting up a new fossil fuel based power plant. For this the PP had an option of setting up a captive power plant either with coal, diesel or natural gas as primary fuel. LRQA confirms that there are no regulations that restrict the use of fossil fuels for power generation to cater the power requirements of private industries.

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

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

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.

According to the ministry of Petroleum and Natural gas[4], most of the production of gas comes from the Western offshore area. The on-shore fields in Assam, Andhra Pradesh and Gujarat States are other major producers of gas. Smaller quantities of gas are also produced in Tripura, Tamil Nadu and Rajasthan States. The infrastructure for supply of gas was noted only in western and northeastern part of India[5]. Setting up a natural gas based power plant was therefore not considered as the plausible baseline.

There are no coal reserves in the state of Karnataka[6]. The nearest coal mines are in Andhra Pradesh where the sourcing will need to take place and therefore increase the transportation costs. Therefore validation team confirms coal as the only fossil fuel considered as a fuel of choice by the PP in their analysis.

Alternative 2: W2 and P6 wherein Waste Energy Carrying Medium (WECM) i.e. surplus blast furnace gas is released to the atmosphere after flaring

[4] http://petroleum.nic.in/ng.htm

[5] http://www.mapsofindia.com/maps/oilandgasmaps/gaspipelines.htm

[6] http://www.mapsofindia.com/maps/india/coalreserves.htm

and the electricity is sourced from gird-connected power plants

As Mukand Limited was sourcing electricity from grid since the start of the steel plant operations and this alternative would not require any additional investment from the PP, continuation of sourcing electricity from the regional grid system is a plausible alternative to be considered. This alternative includes all the fuels from power plants connected to the grid system. Hence, the baseline fuel is identified as the fuel mix of power plants connected to the southern grid system of India.

Review of the CO_2 baseline database published by Central Electricity Authority version 03[7] confirms that the majority of the electricity generated from power plants in the southern regional grid is coal dominated.

Alternative 3: W4 and P1 wherein Waste Energy is used for meeting energy demand without seeking CDM benefits

Since the waste energy may fluctuate based on operating conditions, this energy source would need to be supplemented by fuel oil. This alternative is the project activity not considered as a CDM project.

Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations include the following:

Alternative 1: Captive power plant with coal as the fuel choice.
Alternative 2: Electricity is sourced from grid connected power plants
Alternative 3: Waste energy from MBF-3 is used along with fuel oil to generate electricity.

CAR 06
CAR 06 was issued since PDD version 01 did not describe key assumptions and rationale used for identifying the baseline scenario. PP submitted revised PDD, justifying the baseline scenario. PP revised the PDD to reflect the various steps detailed in the applied methodology. LRQA confirmed that the baseline scenario was identified in accordance with the methodology and closed the CAR.

CAR 07
LRQA raised CAR 07 as the section B.4 of PDD version 01 did not detail how Step 3 of the methodology had been applied. PP revised the PDD

[7] Version 03 of the CEA CO2 baseline database was the most recent data available at the time of submission of PDD for validation
http://www.cea.nic.in/planning/c%20and%20e/government%20of%20india%20website.htm

and applied Step 3 of the applied methodology including the application of "Tool for the demonstration and assessment of additionality". The validation team confirmed that the Step3 was correctly applied and closed the CAR.

Step 3: Step 2 and/ or Step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality"

Simple cost analysis cannot be applied because each of the alternatives generate financial benefit. Investment analysis is therefore considered appropriate in this case. Since there is no investment for Alternative 2 which involves sourcing electricity from grid-connected power plants, the PP have used the levelized cost of electricity production in accordance with sub-step 2b of the "Tool for the demonstration and assessment of additionality" version 05.2.

The validation team confirmed the input values with reference sources and the calculations to confirm the levelized cost. Sensitivity analysis on variables that included the project cost, net electricity generation, and the variable cost was conducted in accordance with the requirements of guidance 17 of Guidelines on the Assessment of Investment Analysis version 3.1.

The following table provides validation of input figures used for calculation of the captive coal based power plant considered as baseline Alternative 1.

Sr.No	Parameter	Value used	Means of validation
1.	Power generation	94779 MWh/annum	These are considered to be same as that for the project activity.
2.	Project cost	6000 lacs i.e. INR 600 million	Report on expert committee on Fuels for power generation[8] provides cost of setting up a coal thermal power plant at 40 million INR/ MW. Considering 15 MW power generation, the cost works out to INR 600 million. The above referenced report was published in 2004 and although the investment decision was taken in 2006, same cost is considered in order to be conservative.
3.	Coal cost	INR 1506/ ton	Report on expert committee on Fuels for power generation which includes the cost of

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

			coal and its transportation.
4.	GCV of coal	3755 kcal/kg	CEA-CO_2 Baseline Database for the India Power Sector-User Guide/ Version 1.1" dated December 2006 (Appendix-B in Pg/-23)[9]
5.	Station Heat rate	3125 Kcal/KWh	CEA-CO_2 Baseline Database for the India Power Sector-User Guide/ Version 1.1" dated December 2006 (Appendix-B in Pg/-23)
6.	Consumption of supplementary fuel (i.e. Furnace Oil)	2 ml/KWh	CEA-CO_2 Baseline Database for the India Power Sector-User Guide/ Version 1.1" dated December 2006 (Appendix-B in Pg/-23)
7.	Water Cost	0.05 INR/KWh	Deemed reasonable on basis of sector expertise given the cost of treatment of the boiler water.
8.	Power Rate for imported power from Southern Regional Grid	INR 3.91/KWh in the first year and annual escalation of 2.49%	1. First year electricity tariff confirmed on basis of the electricity bills prior to the decision making. 2. Escalation of 2.49% based on Wholesale Price Index published by the Office of Economic Advisor, Government of India (available at: http://eaindustry.nic.in)

All other parameters were considered same as that in the project activity, which is a conservative assumption. Validation of these is provided in the next section (additionality).

In determining the levelized cost, the discount factor equivalent to benchmark (as described in subsequent section) has been used. The validation team confirms that the cost of electricity from the grid is INR 4.32/kWh which is less than the levelized cost of electricity from either the captive source using coal as a fuel (INR 4.36/kWh) or the from use of waste energy i.e. project activity (INR 4.47/kWh).

During completeness check, following query was received.

Comment

2. The DOE has indicated that the levelized cost of electricity production for the baseline scenario (BFG) is 4.47 INR/kWh, 4.36 INR/kWh for coal alternative and 4.32 INR/kWh for electricity import alternative. Also, the levelized cost of electricity production considers 2893 tonnes/annum of "Furnace oil

[9] http://www.cea.nic.in/planning/c%20and%20e/government%20of%20india%20website.htm – This report was available during the time of investment decision. However the value remains the same even in the current data base version 05 as available from November 2009.

consumption during shut down period of Blast Furnace" for the BFG alternative (the proposed project). The DOE shall indicate how it has validated that the conservativeness of using Furnace Oil (FO) during shut down periods instead of electricity imports when, as indicated in the Validation Report, the PP used to import electricity from the grid in the baseline scenario and the levelized cost comparison indicates that electricity import from the Indian Southern Regional grid is the most economical alternative.

Clarification

PP/DoE Response

This to clarify that furnace oil will be consumed in the project activity power plant only in emergency situations when there is insufficient availability or non-availability of Blast Furnace Gas (BFG). This may happen due to some operational problems in the Blast Furnace or due to shut down of the Blast Furnace resulting from:

- Failure of critical component of Blast Furnaces like Tuyere, Charging System, Hot Blast Main, Hot Blast Valve *etc.*
- Material hanging resulting from abnormal behaviour of Blast Furnaces, improper particulate sizing problems, poor burden distribution, high moisture content in raw material *etc.*
- Non-functioning of the Blast Furnace Blower
- Power disruption

However these operational problems generally occur all of a sudden thereby leading to immediate insufficiency or non-availability of BFG for power generation. Since there is no prior intimation for this kind of operational problems, the project proponent cannot start importing power from the grid immediately under these situations. This is because to import power from the grid beyond their contract demand, the project proponent would require to submit a power drawl schedule well in advance to the grid authority so that the generation in the grid connected power plants is accordingly increased. Otherwise the same will distort the grid discipline which will have a cascading impact on all the grid connected power plants. Furthermore, this will again depend on the availability of surplus power at the grid at that particular instance. Therefore there is complete unpredictability in terms of importing power from the grid under situations of insufficient availability or non-availability of BFG resulting from operational problems in the Blast Furnace.

Steel plant operation is extremely power intensive. Reliable and consistent power supply to steel plant equipments/machineries is an essential requirement to maintain the operational stability of the steel plant. The operational stability of a steel plant is of paramount importance which cannot be compromised under any circumstance. Power disruption for few seconds will not only impair the productivity of the steel plant, but will also affect the safety, reliability and stability of the steel plant operation.

Furthermore sudden disruption in power supply will result in a Power System disturbance that may lead to complete isolation from all the external power sources and corresponding failure in a cascade mode. Such shocks to the power driven equipments/machineries adversely affect the equipment life and can cause significant capital damages by adversely impacting their operational performance. It is extremely important for the project proponent to ensure continuous supply of power to the steel plant even under situations of insufficient or non-availability of BFG due to operational problems in the Blast Furnace. This explains why the project proponent would use furnace oil for power generation instead of importing power from the grid under situations wherein the Blast Furnace encounters some operational problems leading to insufficient or non-availability of BFG for power generation.

Further, sensitivity analysis on key parameters such as project cost, variable cost and electricity generation was conducted as below:

Alternative 1: Captive power plant with coal as the fuel choice.

Sensitivity variation	+10% variation	-10% variation	Validation opinion
Project cost	INR 4.51/kWh	INR 4.20/kWh	The project cost is based on the data published in the year 2004. As per the Government published publicly available data at the time of the investment decision, the price of non-electrical machineries, electrical industrial machineries and all commodities have been subjected to an annual price escalation of 4.57%, 2.63% and 5.01% respectively[10]. Hence the capital cost is not expected to decrease rather increase.
Variable cost	INR 4.38/kWh	INR 4.33/kWh	Variations do not result in the levelised cost equalling to the grid cost.
Electricity generation	INR 4.21/kWh	INR 4.53/kWh	As the alternatives are compared considering the same output an increase in the electricity generation is not considered to be appropriate. Also, additional electricity will only be generated if there is demand in the steel plant.

[10] http://eaindustry.nic.in/

Alternative 3: Waste energy from MBF-3 is used along with fuel oil to generate electricity (Project activity without CDM).

Sensitivity variation	+10% variation	-10% variation	Validation opinion
Project cost	INR 4.62/kWh	INR 4.32/kWh	It is unlikely that there is a reduction in the project cost from that of the estimated project cost considered at the time of approval of the project activity. LRQA confirmed the actual costs incurred by the PP and expected costs till commissioning of the project which is expected to be more than the estimated project cost by approximately 4%.
Variable cost	INR 4.49/kWh	INR 4.45/kWh	Variations do not result in the levelised cost equalling to the grid cost.
Electricity generation	INR 4.19/kWh	INR 4.81/kWh	Electricity generation in the project activity is subject to availability of blast furnace gas. An increase in the BF gas availability is not expected. This was confirmed from the actual BF gas generation records obtained from the plant operational data. Of the nine months operational data, LRQA verified that the maximum BF gas generation was 62,754 Nm3/hr which results in a levelised cost of INR 4.51/kWh much higher than the levelised cost for grid. Furthermore, it is not practical only to use the BF gas for power generation as BF gas is subject to fluctuations and it is not possible to generate electricity only depending on the BF gas. Hence, this situation is unlikely.

Hence LRQA confirms that Alternative 2, i.e. electricity sourced from grid connected power plants as the baseline for the project activity.

Comment 4

4. For the coal alternative, the DOE should indicate how it has validated the suitability of input values to the levelized cost comparison, in particular the total investment cost and each one of its 3 main components (plant and machinery cost, civil cost, and other cost).

Clarification

The project proponent and the DOE would hereby like to clarify that for the coal based captive power generation alternative, the total project cost (*i.e.* total capital investment) has been considered as INR 40 million/MW (totalling to INR 600 million for a 15MW coal based captive power plant) as per the guidance provided in the *"Report of the Expert Committee on Fuels for Power Generation"* published by the Central Electricity Authority (CEA) of Government of India (please refer to Pg/-11 of the Report enclosed as Annexure-I).

This assumption has been further cross-validated with an international publication, *"Cost and carbon emissions of coal and combined cycle power plants in India: Implications for costs of climate mitigation projects in a nascent market"* published by Ernest Orlando Lawrence Berkeley National Laboratory (please refer to Pg/-14 of the Report enclosed as Annexure-II) wherein the capital cost of coal based power plant is reported as USD 1036/kW *i.e.* around INR 45 million/MW (with forex rate as 1 USD = INR 43)

This further justifies the conservativeness of the project cost assumption.

Published information with respect of further split in cost of a power plant into sub-categories of (i) Plant & Machinery (ii) Civil cost and (iii) Other cost has not been available. The PP presented a statement from the technical consultant, Steam (India) that the Plant and Machinery cost is about 80% while the civil cost is about 18 – 20%. Based on sector expertise, the validation team deemed this appropriate.

In the comparison of levelized cost, the PP had considered the same percent for the split between the Plant and Machinery, Civil cost and other cost for the costing of the waste heat recovery electricity generation provided by the technical consultant and the costing of the coal power plant. The validation team considers this as a reasonable assumption in estimating the levelized cost of electricity generation.

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.

This step is not applicable.

Additionality

The project additionality was demonstrated by the PP using the Tool for the demonstration and assessment of additionality Version 05.2.

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. The two alternatives available with the project proponent are as below:

1) Generation of equivalent power in grid-connected power plants
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

Investment analysis was used for the demonstration of additionality. A simple cost analysis can not be applied because the project activity produces other revenues than those associated with the sale of CERs; specifically sale of electricity produced.

Investment comparison analysis can not be applied because the baseline scenario is equivalent electricity supply by the electricity grid system that does not have any investment activity. Since the proposed project activity could benefit from the sale of electricity in addition to the proceeds from CERs, the PP selected the third option of "apply benchmark analysis" for the investment analysis of the proposed project activity, which was considered appropriate.

Appropriateness of Benchmark:

As per the Guidance 12 of 'Guidelines on the assessment of investment analysis' version 03.1, in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR.

PP has presented the benchmark as weighted average cost of capital (WACC) for comparison with the project IRR. LRQA confirms that the benchmark shall be appropriate to the type of calculation applied.

WACC is calculated as the weighted average of the cost of capital and effective cost of loan. The cost of equity is calculated from the publicly

available information. Validation team has confirmed that no loan has been taken for the project through interview with the PP and the project financials.

As the project does not involve any debt, the WACC will be equivalent to the expected return on equity. 'Expected return on equity' based on the Capital Asset Pricing Model (CAPM) method is calculated with the help of the following formula:
Re = Rf +B (Rm-Rf)

Where,

Re	- Expected return on the equity
Rf	- Risk free rate of return
Rm	- Expected market returns
B	- Beta
(Rm-Rf)	- Market risk premium

LRQA further validated the following components of CAPM:

Risk free rate of return (Rf):

The risk free rate is the return that is assured on capital investment. Essentially, these are the financial instruments for investment without any default risk. In case of host country, India, the Government of India bonds or securities are considered as the most suitable representative for calculation of risk free rate in the market. LRQA confirmed that the returns on Central Government securities for an average 10-year yield as verified from the Annual report of Reserve Bank of India (RBI) available on the official website of the RBI[11] which averaged 7.12% during the year 2005-06. LRQA confirmed that the Annual report of RBI for year 2005-06 was released on 30 August 2006[12] and hence was the latest such report available at the time of investment decision during May 2007.

Market rate of return (Rm)

The market rate of return has been based on the publicly available stock index, National Stock Exchange (NSE). The National Stock Exchange (NSE) is India's leading stock exchange covering various cities and towns across the country. The S&P CNX Nifty index on NSE is a well diversified 50 stock index accounting 22 sectors of the economy which includes the steel and power sector[13]. The S&P CNX Nifty index can therefore be considered as representative for determining the average market return.

The average market return has been calculated with the help of the

[11] http://rbidocs.rbi.org.in/rdocs/AnnualReport/PDFs/72286.pdf (refer page 68 of the report)

[12] http://rbidocs.rbi.org.in/rdocs/PressRelease/PDFs/72200.pdf

[13] http://www.nse-india.com/content/indices/ind_nifty.htm

Compound Annual Growth Rate (CAGR). The CAGR gives the measure of the average returns from the stock market investments over a period of time. It is a more accurate measure than simple average of returns and calculated as:

CAGR = (index value at end / index value at beginning) ^ (1 / no. of years) - 1

Ending value of Nifty Fifty on 31st March 2007 was 3633.6
Beginning value of Nifty Fifty on 01 Jan 2001 was 1254.3
And number of years as 6.25

LRQA confirms the computation for market rate of return as 18.55% for the period of more than six years ranging from 01 January 2001 to 31 March 2007[14].

As there are other indices apart from S&P CNX Nifty index which can be used for representing market rate of return, LRQA performed an independent computation of market rate of return considering other representative indices of NSE and Bombay Stock Exchange (BSE) for the same time period. Results are as below:

Index referred	Market rate of return	Resultant WACC (benchmark)
BSE SENSEX	21.08%	23.31%
BSE 500	23.83%	26.50%
BSE 200	22.57%	25.04%
NSE CNX 500	22.00%	24.38%

LRQA confirms that the market rate of return of 18.55% as considered for deriving the benchmark is conservative.

Beta (B)

Beta is the measure of risk of a specific sector/company. Beta of steel sector can be applied as proxy risk profile for the project activity for determination of expected return on Equity. Use of beta for the steel sector was considered appropriate in view of the information note issued by the EB on previous rulings related to the appropriateness of benchmarks for project activities utilizing waste heat/ waste gas for power generation (EB51 Annex 59). Since the electricity produced is meant for captive consumption, the benchmark of the core business is considered appropriate. The Beta in the CAPM equation helps account for the systematic risk by quantifying the sensitivity of the stock of a listed company representing a particular project type/sector with the market returns.

The project proponent has arrived at the beta value of 1.16 which is the

[14] http://www.nse-india.com/content/indices/ind_histvalues.htm

average of the beta values of fourteen major companies in the steel sector. The average beta value of 1.16 is deemed conservative on comparing with 1.51 beta value for Mukand Ltd. LRQA confirmed that the referred report published by Haribhakti Group was available at the time of investment decision making[15]. Haribhakti group is a renowned firm involved in providing services for Audit & Assurance, Risk Advisory, Tax Advisory, Corporate Finance Advisory[16], hence LRQA deemed the published report to be appropriate.

The benchmark thus calculated for the project activity is
Re = Rf +B (Rm-Rf)
= 7.12 +1.16 x (18.55 – 7.12)
= 20.38%

20.38% is reasonable and acceptable.

Internal Rate of Return:
LRQA validated the timings of investment decision taken by the project proponent (refer the section "Investment decision") and the consistency and appropriateness of the input values with the timing of investment decision. The input values / assumptions considered during the investment decision are consistently applied in the financial calculations. The evaluation of the same is presented in the table below.

The assessment period of the financial analysis is 15 years. The declaration from the manufacturer of boiler and turbine state that the technical life of the equipment is 15 years and that it can be increased with proper care through operation and maintenance. A fair value for the project equipment and building that is equivalent to the depreciated value has been considered in accordance with the relevant tax calculations of the host country. LRQA confirms the approach to be in line with the guidance-3 and guidance-4 of 'Guidelines on the assessment of investment analysis" version 03.1.

LRQA confirmed the depreciation is calculated as per the Companies Act, 1956 and that depreciation is added back to the net profits for calculation of project IRR which is in accordance with guidance-5 of the "Guidelines on the Assessment of Investment Analysis" version 03.1.

The major input parameters have been listed below along with the validation opinion on the suitability of values:

S. No.	Parameter	Value	Validation Opinion
1.	Installed capacity of the Steam turbine generator (STG)	15 MW	Confirmed from the technical specifications provided by the STG provider

[15] http://www.bdoindia.co.in/uploadedfile/1/2/-1/Bottom-up_Beta.pdf

[16] http://www.bdoindia.co.in/about_thegroup.aspx

S. No.	Parameter	Value	Validation Opinion
2.	Capacity of dual fired boiler	55 TPH	Confirmed from the technical specifications provided by the supplier
3.	Auxiliary steam consumption in boiler	4.1 TPH	Steam requirement is for oil pre-heater, steam tracing and atomizing the furnace oil. Apart for these, steam is also required for utilities. LRQA confirmed the auxiliary steam requirement from letter from the boiler supplier and engineering consultant. Furthermore, same was found to be reasonable based on the sector expertise.
4.	Gross electricity generation	105.31 GWh/annum	Calculated value
5.	Auxiliary consumption of electricity	10%	Value is deemed reasonable based on review of similar projects. LRQA cross checked information of a similar blast furnace gas based power plant available on http://www.lancoindustries.com/powerplant.htm
6.	Net electricity generation	94,779 MWh/annum	Calculated value based on the steam generation potential, specific steam consumption of turbine while accounting for 10% auxiliary consumption and 350 operational days of power plant as under: (50.9/4.06) x 0.9 x 24 x 350 = 94,779 MWh. LRQA confirms through its sector expertise that the generation in the first year is 70% of the rated generation in other years on account of potential fluctuation of waste energy supply and inexperience of operational staff. The operational cost is also reduced in the year by the same proportion to maintain consistency in the investment analysis. During completeness check, further validation wrt 70% electricity generation in the first year was requested. See below this table for response.
7.	Power Rate for imported power from Southern Regional Grid	INR 3.91/KWh in the first year and annual escalation of 2.49%	1. First year electricity tariff confirmed on basis of the electricity bills prior to the decision making. 2. Escalation of 2.49% based on Wholesale Price Index published by the Office of Economic Advisor, Government of India (available at: http://eaindustry.nic.in)
8.	Project cost	INR 555.6 million	The value is sourced from the detailed project cost report prepared by Fichtner

S. No.	Parameter	Value	Validation Opinion
			Consulting Engineers (India) Private Limited. The report was available to Mukand Ltd. on 29/11/2006; and was considered during the investment decision on 22/05/2007. Moreover, as per the financials provided by independent Chartered Accountant on 13/04/2010, the actual project cost is expected to exceed the estimated cost of INR 555.6 million. Hence the project cost considered is deemed reasonable and conservative.
9.	Blast furnace gas generation from MBF-3	82,530 Nm^3/hour	Calculated based on the wind volume in blast furnace of 31500 Nm3/hour per blower (63,000 Nm^3/hour for two blowers present in MBF-3) and the conversion factor of 1.31. 63,000 x 1.31 = 82,530 Nm3/hour LRQA confirmed the same from certificate provided by chartered engineer and deemed reasonable based on its sector expertise. In addition, the Validation team cross checked the operational data of MBF-3 so to confirm the conversion factor. Based on the MBF-3 operation during the period February 2010 to October 2010, the conversion factor averaged 1.30. Hence a conversion factor of 1.31 is deemed conservative.
10.	Consumption of blast furnace gases in hot blast stoves	23%	Confirmed from certificate provided by chartered engineer and deemed reasonable based on LRQA sector expertise.
11.	Operational days of MBF-3	345	Considering 20 days for maintenance 345 operational days are reasonable. Same was cross verified from the certificate provided by chartered engineer. The power plant is to operate for 350 days. On days when MBF-3 is not in operation, the power plant will be operated on FO.
12.	Availability of MBF-3	93%	Same was confirmed from the certificate provided by chartered engineer and found to be reasonable.
13.	Calorific value of blast furnace gas	640 kCal/Nm^3	Confirmed from the gas analysis report by independent laboratory
14.	Efficiency of boiler with 100% blast furnace gas firing	86.1%	Confirmed from the technical specifications provided by the boiler supplier
15.	Efficiency of boiler	87.9%	Confirmed from the technical

S. No.	Parameter	Value	Validation Opinion
	with 100% furnace oil firing		specifications provided by the boiler supplier
16.	Calorific value of furnace oil	10,000 kCal/kg	Confirmed from fuel supplier
17.	Cost of furnace oil	INR 23.95/kg	Cross checked the furnace oil purchase records prior to decision making
18.	Cost of consumables stores and spares	1% of total project cost	Confirmed from the CERC (Terms and conditions of tariff) regulations dated 26/03/2004. Validation team confirmed the regulations were applicable at the time of investment decision making and hence considered to be appropriate.
19.	Cost of Repairs and maintenance	2.5% of total project cost	Confirmed from the CERC (Terms and conditions of tariff) regulations dated 26/03/2004. Validation team confirmed the regulations were applicable at the time of investment decision making and hence considered to be appropriate.
20.	Administrative expenses	INR 2.8 million/year	Confirmed form certificate from independent Chartered Accountant
21.	Insurance cost	INR 5.6 million/year	Confirmed from the insurance quotations received by Mukand Ltd.
22.	Escalation rates	Wages & salaries: 5.28% Maintenance : 2.63% Electricity rate: 2.49% FO: 14.28% Commodities : 5.01%	Calculated based on the wholesale price index published by the Office of economic advisor, Government of India. Confirmed from the official website http://eaindustry.nic.in. The escalation rate is based on the ten year trend prior to date of investment decision (1997-98 to 2006-07)[17] which is considered reasonable.
23.	Depreciation rate for building costs	3.34%	In accordance with the local laws. LRQA confirmed the same from the Companies Act 1956.
24.	Depreciation rate for plant and machineries costs	5.28%	In accordance with the local laws. LRQA confirmed the same from the Companies Act 1956.
25.	Corporate tax	33.99%	In accordance with the local taxation laws. Tax rate is calculated as base rate with 10% surcharge and 3% education cess.

[17] Except for escalation determined for electricity rate which is calculated over a period of five years (2002-03 to 2006-07) so as to account the changes due to the Electricity Act, 2003.

S. No.	Parameter	Value	Validation Opinion
			Base rate for corporate tax is 30%. Hence the final figure is 33.99% for corporate tax. LRQA confirmed the same from the Income tax act 1961 and subsequent finance bills

All the investment analysis worksheet reference is provided in spreadsheet with all the relevant cells viewable and unprotected.

Considering the above mentioned input values, the post tax internal rate of return from the project has been calculated. The return from the project is 17.78%. LRQA has confirmed that the calculation procedure for IRR is appropriate in accordance with the Additionality Tool.

Comment 3

The DOE should indicate how it has validated the use of a 70% electricity generation factor in the first year of operations for the proposed project activity when the coal alternative uses a 100% electricity generation factor.

Clarification

We would hereby like to clarify that unlike a coal fired boiler, the control system in a BFG fired boiler is bit complicated as it depends on many fuel parameters like:

- BF Gas Flow
- BF Gas Pressure
- BF Gas Calorific Value
- Condensation, Pressure & Temperature Drop at BF Gas network
- Pipeline leakage

All these parameters are beyond the control of the project proponent and depends hugely on the Blast Furnace operation in the upstream. Therefore in the initial phase *i.e.* in the first year of commissioning of the BFG fired boiler, the project proponent expects to encounter certain operational problems before the boiler operation is stabilized due to fluctuations in any of the parameters as cited above. Furthermore, due to possibilities of improper gas cleaning at the initial phase, it is also expected to experience boiler teething problems which may impact the boiler operation and hence the boiler availability.

These initial teething problems are expected to be rectified once the boiler operation is stabilized. At the time of project conceptualization, the project proponent has consulted the possibility of boiler availability in the first year of its operation with the technical consultant. Based on the inputs from the technical consultant, the project proponent has assumed a factor of 70% of boiler availability in the first year of operation and hence 70% of electricity generation in the first year of operation. LRQA has sighted the letter from the technical consultant, Steam (India)

{ http://www.steamindia.in/index.html } which stated that in the initial 12-18 month period, the boiler availability is 65% - 70%.

In addition, LRQA sampled monitoring reports of registered CDM project activities; the summary of which is presented in the table below. The table clearly shows that the generation and supply of electricity is consistently lesser than that 70% of the estimated annual generations in the registered project activities. In case of project activity, 0696, it may be kindly noted that the registered PDD had considered a PLF of 70% and 300 operational days. Therefore, consideration of 70% electricity supply in the first year of operation is conservative.

Unlike a coal boiler operation, the control system in a waste gas fired or waste heat recovery based boiler is bit complicated as its operation depends on many parameters like the waste gas flow, waste gas pressure, calorific value of the waste gas or the sensible heat content of the waste energy carrying medium, condensation, pressure and temperature drop at the waste gas network, pipeline leakage etc. All of the projects (Project Ref Nos 0515, 0535 and 0696, whose reference has been drawn in this context) are basically waste gas based power generation projects and have similar operational characteristics as that of the project activity under consideration by Mukand Limited. Moreover, all of the above projects belong to the same sector i.e. Iron & Steel or the Metal sector. Furthermore, the project activity under consideration is a 15 MW waste gas based power generation project by Mukand Limited and therefore in order to draw the reference to substantiate the point of discussion, references have been selected with projects of power generation capacity ranging from10 MW to 30 MW which very well covers the range of the project by Mukand Limited to justify the point of concern.

Table: Comparison of registered CDM project activities with respect of supply of net electricity in the first year

	OSIL (0515)		SESA (0535)		USHA (0696)	
Registered PDD	Gross Elec generation as per registered PDD for each year	55400	Gross Elec generation as per registered PDD for each year	184000	Gross electricity generation as per registered PDD for each year	43200
	Net electricity supplied as per registered PDD for each year	49900	Net electricity supply as per registered PDD for each year	148110	Net electricity supply as per registered PDD for each year	36720
Monitoring Report (Year 1)	Actual Gross Electricity generated as per monitoring plan (July 2001-Mar 2002)	25048.20	Actual Gross Electricity generated as per monitoring plan (June 2007-Mar 2008)	83667	Actual Gross electricity generated in Year 1 (Dec 2004-Nov 2005)	
	Actual Net Electricity supplied as per monitoring plan (July 2001-Mar 2002)	21283.47	Actual Net electricity supplied as per monitoring period (June 2007-Mar 2008)	57080	Actual Net electricity supplied in Year 1 (Dec 2004 - Nov 2005)	28234.15
	Net supply of electricity extrapolated to one year. Refer Note 1	28377.96	Net supply of electricity extrapolated to one year. Refer Note 1	68496		
	Percent supply (Note 2)	56.87	Percent supply	37.23	Percent supply	76.89
Monitoring Report (Year 2)	Actual Gross Electricity generated as per monitoring plan in Year 2 (April - Mar 2003	56573.21	Actual Gross electricity generated as per monitoring period in Year 2 (April 2008-Mar 2009)	111637.00	Actual Gross electricity generated in Year 2 (Dec 2005-Nov 2006)	
	Net supply of Electricity as per monitoring plan in Year 2 (April - Mar 2003	48956.94	Actual net electricity supplied as per monitoring period in Year 2 (April 2008-Mar 2009)	78507.00	Actual Net electricity supplied in Year 2 (Dec 2005 - Nov 2006)	25272.64
	Percent supply	98.11	Percent supply	53.01	Percent supply	68.83

Note 1: Since the Monitoring report covered less than one year, the Net supply of electricity was extrapolated to one year.
Note 2: Percent supply is calculated with reference to the ex-ante electricity supply determined in the registered PDD.

Sensitivity analysis:

In order to check the robustness of additionality, PP has presented the sensitivity of critical input values. The critical input values identified by the PP are project cost, net electricity generation, electricity tariff, cost of furnace oil, and variable cost. The PP has considered 10% variation in critical input values which is in accordance with the guidelines for the assessment of investment analysis.

The summary of sensitivity analysis is:

Parameter	10%	-10%
Project cost	15.35%	20.64%
Electricity generation	23.07%	9.09%
Electricity rate	23.53%	7.32%
Cost of furnace oil	13.24%	20.82%
Variable cost	17.15%	18.39%

LRQA validated the calculations in the spreadsheet that provides the sensitivity analysis of the parameters provided.

Project cost:
Variation in the project cost by -8.15% results in IRR crossing the benchmark, LRQA could confirm that a negative variation of project cost by -8.15% is not likely given PP has already committed INR 470.72 million by issuing purchase orders, while another INR 105.0 million are expected to be incurred by the PP for completion of the project implementation, hence totalling to INR 575.72 million (i.e. approximately 4% higher than the estimated cost of INR 555.6 million). LRQA confirmed the actual project cost incurred till 14/03/2010 from certificate issued by independent chartered accountant.

Electricity generation:
Electricity generation in the project activity is subject to availability of blast furnace gas. An increase in the BF gas availability is not expected. This was confirmed from the actual BF gas generation records obtained from the plant operational data. Of the nine months operational data, LRQA verified that the maximum BF gas generation was 62,754 Nm3/hr as against 66,000 Nm3/hr considered in the investment analysis. In determining the maximum electricity generation potential of the project activity, the designers have considered it on basis of the maximum capacity of the steam generation from the boiler (55 tph) considering auxiliary steam consumption and operational days of the boiler of 350 days per year. The validation team confirmed that generation more than 94,779 MWh is not possible

Electricity tariff:

The electricity purchase tariff was further validated by confirming the recent tariff orders issued by the Karnataka State Electricity Regulatory Commission (KSERC). The latest increase was effected in November 2009. The tariff has increased

intermittently from year 2000 to 2010 and is equivalent to an annual increase of 2.84% for the first 100,000 units and 2.06% for subsequent units.

At the time of decision making, with the available tariff of previous years, the PP had considered an increase in tariff of 2.49% which has been applied in the investment analysis. The validation team confirms that the project IRR remains at 18.27%, which is below the benchmark of 20.38% even when a flat increase in tariff of 2.84% is considered.

The project IRR crosses the bench mark, when the electricity rate is increased by 4.13% after considering an year on year increase of the tariff by 2.49%.

An escalation of 2.49% in electricity tariff rate has already been considered in the determination of the returns from the project activity based on the Wholesale Price Index published by the Office of Economic Advisor, Government of India (available at: http://eaindustry.nic.in. A ten year period from 1997-98 to 2007-8 has been considered. It is therefore unlikely that the electricity tariff rate will increase by a further 4.13%. In addition, LRQA reviewed the electricity tariff policies in place in Karnataka from the year 2000 to 2010 and noted that the average annual escalation in tariff for the first one lac unit generation was 2.84% and for subsequent units was only 2.06%. Therefore, a further escalation of 4.13% in electricity tariff is unlikely.

At the time of decision making, two tariff slabs were in existence. For consumption upto 100,000 units, the tariff rate was INR 3.8/kWh. For consumption beyond 100,000 units, the tariff rate was INR 4.3/kWh. PP had applied the lower tariff rate of INR 3.8/kWh in the version 01 of the IRR spreadsheet submitted along with PDD version 01. However, during validation this rate was corrected so as to consider the generation weighted average tariff rate for a period of April 2005 to December 2006 based on the average number of units being consumed. Hence the resultant tariff rate of INR 3.9/kWh considered for IRR computations is deemed appropriate.

Cost of furnace oil:
LRQA confirmed from the wholesale price index of furnace oil for a period of more than 10 years so as to confirm that a decrease in the furnace oil price is highly unlikely. During the completeness check, following comment was received.

Comment 5

For the proposed project alternative the DOE should indicate how it has considered a continuous annual increase of 14.8% in Furnace Oil price during 15 years a realistic and conservative assumption.

Clarification

The annual average escalation in furnace oil price (*i.e.* 14.28% per annum) has been computed based on historical price trend as per WPI http://eaindustry.nic.in published by the Office of Economic Advisor, Government of India for the period 1997-98 to 2006-7. This website has since been updated now shows the data for the period 2005-6 – 20010-

2011. However, a hard copy of the data for the period 1997-98 to 2006-07 used in the analysis during validation was preserved and included as Annexure III.

The price escalation of furnace oil has been further cross-validated with the historic price escalation of crude oil in India which is the primary feedstock for furnace oil production. The annual average escalation in crude oil price, as published by Indiastat.com (Annexure IV) over the years 2002-2003 to 2009-2010 has been found to be 14.72% which is higher than 14.28% as assumed for furnace oil. Therefore it can be concluded that the reflection of increase in crude oil price further substantiates the furnace oil price increase in the Indian market.

International Prices of Petrol, Diesel, LPG and Crude Oil (2002-2003 to 2009-2010)				
Year	Diesel (0.5%s)	Petrol	Indian Basket (Crude)	LPG
	*$/Bbl	$/Bbl	$/Bbl	$/MT
2002-03	28.93	30.15	26.67	280.4
2003-04	30.48	35.03	27.96	278.45
2004-05	45.28	48.08	37.61	360.1
2005-06	64.7	64.51	55.72	481.04
2006-07	74.12	72.62	62.46	499.67
2007-08	92.91	90.76	79.25	683.49
2008-09	101.75	89.42	83.57	688
2009-10	74.67	76.23	69.76	582.69
Price Escalation (%)	14.51	14.17	14.72	11.01

Furthermore, since the annual average escalation in furnace oil price has been computed as the 'Compounded Annual Growth Rate (CAGR)', hence this will truly reflect the expected annual average escalation in furnace oil price over the next 15 years. This is to be further noted here that furnace oil being a depleting natural resource with significantly high global demand, the price of the same is expected to rise at a much higher rate both internationally as well as domestically. The above justification clearly establishes the rational and conservativeness of furnace oil price escalation assumption.

Variable cost:

Variations in variable cost do not result in IRR crossing the benchmark.

Hence LRQA confirms the proposed project is not considered financially feasible if it is not implemented as a CDM project activity.

Barrier analysis

Barrier analysis has not been used for demonstration of additionality.

Common practice analysis

For assessing the common practice analysis, the mini blast furnace units in India have been considered. As per the association of Indian Mini Blast furnaces, there are total 28 mini blast furnace units operating in India.

PP has correctly defined the criteria for common practice analysis to include mini blast furnaces equipped with WHR facilities that were set-up after the electricity Act was rolled out in 2003 and whose generation capacity is about the same as that of the project activity.

The criteria based on electricity act was deemed valid since the act brought about certain fundamental changes in the manner in which electricity generation, transmission and distribution took place prior to this act. The electricity act made each of these more accountable as well as sale of power to the grid permissible. Prior to the Electricity Act, 2003, power generation was not assured to power intensive manufacturing industries such as steel/iron sector. However, with the bifurcation of the state power companies into three separate entities that are accountable, the power stability increased. Therefore, the need to generate self power for such heavy consuming industries reduced.

The criteria of not considering facilities generating +/- 50% of the capacity of the project activity was also deemed valid since such a scale difference makes projects intrinsically different from each other.

An independent web search conducted by the validation team confirmed that twelve out of twenty eight facilities do not have any power generation from waste gases. Of the remaining sixteen facilities, seven WHR facilities had considered CDM revenues which were confirmed from their posting on the UNFCCC website, while seven facilities had a power generation capacity of less than 50% were confirmed from public source documents available on the internet homepages of the companies or business bulletins.

The remaining two facilities were set up prior to 2002-03 before the enactment of the Electricity Act 2003 and hence not in a comparable framework as mentioned earlier in this section.

Hence LRQA could confirm that the proposed CDM project activity is not common practice.

However, the following issues were raise during validation and subsequently closed,

CAR 08

Section B.5 of PDD version 01 did follow the step wise approach for

demonstration and assessment of additionality as required by the "Tool for the demonstration and assessment of additionality". Also, PDD version 01 referred to version 04 of the tool, whereas version 05.2 is the latest version available. Hence CAR 08 was raised. PP revised section B.5 so as to refer version 05.2 of the tool and follow the step wise approach as required by the tool for demonstrating additionality. Hence, CAR 08 was closed.

CAR 09
As PDD version 01 did not mention and justify the sensitivity variables, CAR 09 was raised. PP submitted the revised PDD justifying the sensitivity variables. LRQA confirmed the variables considered – project cost, electricity rate, FO cost, O&M cost and variable cost to be appropriate for the project activity, hence CAR 09 was closed.

CAR 10
PP presented technological barriers for justifying additionality in section B.5 of PDD version 01. LRQA requested PP to provide further justification for the barriers claimed by raising CAR 10. As the barriers presented under section B.5 could not be adequately substantiated, PP removed the same from the revised PDD. This is in line with para 117 (a) of the CDM VVM. Hence CAR was closed.

CL 03
CL 03 was raised for clarifying the calculation of estimated power generation, boiler efficiency, availability of MBF and power tariff rate in the IRR spreadsheets provided along with PDD version 1.0. PP submitted the revised IRR spreadsheets with the appropriate corrections and supporting evidences which was found to be appropriate. Hence CL was closed.

Prior serious consideration of CDM

In validating the start date of the project activity, the validation team reviewed the following documents:

1. Advance payment to ISGEC John Thompson for supply of boiler and auxiliaries dated 01/06/2007
2. Purchase Order issued to ISGEC John Thompson for supply of boiler and auxiliaries dated 29/01/2008
3. Purchase Order issued to Qingdao Jieneng Power Station Engineering P. Ltd. for supply of steam turbine generator and its auxiliaries dated 10/07/2008
4. Purchase order issued to Suprada constructions company for civil and structural jobs dated 30/11/2007
5. Purchase order issued to APT Power EPC Limited for mechanical works dated 14/07/2008

Since 01st June 2007 corresponds to the earliest of the early start dates in accordance with CDM Glossary of terms, the validation team confirmed this date as the start date of the project activity.

Since, the start date was prior to the date of the publication of the PDD for global stakeholder consultation that commenced on 10th July 2008, the PP needs to demonstrate that awareness about CDM and that CDM was seriously considered in the decision to implement the project activity. To confirm the serious consideration of CDM, LRQA reviewed the extracts of the Board meeting of Mukand Limited held on 22nd May 2007. During board meeting the feasibility of setting up a 15 MW blast furnace power plant by utilizing the surplus blast furnace gases from MBF-3 were discussed. The board noted the estimated costs for the project activity and the financial evaluation and recorded that project returns were unattractive to proceed with the project on a stand-alone basis. Board noted that the revenues available from carbon credits would help improve the financials of the project and make it viable.

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

In the "Guidelines on the demonstration and assessment of prior consideration of CDM" version 03 (EB49 Annex 22) further guidelines were provided by EB for validating the continuing real action. Clause 7 states that "Assessment of real and continuing actions shall be validated by the DOE and the validation should focus on real documented evidence as indicated in paragraph 6 (b), including an assessment by the DOE of the authenticity of the evidence. " – The real and continuing action in the project case as was validated based on real documents are:

- Board Decision for seeking CDM status of the project – 22nd May 2007
- Appointment of CDM Consultant (Ernst & Young) – 04th October 2007
- Application for seeking Letter of Approval from host country – 28th May 2008
- Appointment of DOE (LRQA Ltd) – 06th June 2008
- LoA from DNA – 03rd September 2008.

Clause 8(a) states, In validating proposed CDM project activities where: there is less than 2 years of a gap between the documented evidence the DOE shall conclude that continuing and real actions were taken to secure CDM status for the project activity.

Through the process of validation, LRQA confirms that the CDM benefits were considered necessary in the decision to undertake the project as a CDM project activity by the management.

However, CAR 11 had to be raised by the validation team and addressed by the PP through the validation process.

CAR 11
Since the project start date of the project activity is before the validation, evidence for serious consideration and implementation timeline was requested from PP.

Project implementation timeline and evidences have been provided to the validation team. The justification and implementation timeline is in accordance with the guidelines for assessment of prior consideration of CDM. Therefore, the finding has been closed.

4.4 Emission reductions

Baseline Emissions

The baseline emissions are calculated from the net power generation from the project activity, CO2 emission factor for the electricity source *i* (*i.e.* southern regional grid) displaced due to the project activity during the year y (in tonnes CO2/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:

$$\mathrm{BE}_{\mathrm{y}} = \mathrm{BE}_{\mathrm{En,y}} + \mathrm{BE}_{\mathrm{flst,y}}$$

Since there would not be any steam requirement in order to flare the waste blast furnace gas generated from the MBF-3 at Mukand Limited in absence of the project activity *i.e.,*

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

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

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

In accordance with the guidance provided in the methodology, the baseline emissions from electrical energy generated by the project activity will be computed as:

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

Determination of fcap

PP has applied Method-2 prescribed by ACM0012 version 3.2 as three year data related to the production is not available. LRQA confirmed that the MBF-3 was commissioned during March 2008[18] and hence, Method-1 cannot be applied which requires the production data for three years. As per the methodological requirements, Method-2 is assessed to be appropriate.

As per Method-2, fcap is determined as given below:

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

The quantity of waste energy i.e. Surplus BFG that would have been generated prior to the start of the project activity i.e. QWCM,BL will be calculated as:

[18] Commissioning certificate dated 14/05/2008 confirming the MBF-3 was commissioned on 29/03/2008

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

$Q_{BL,product}$ is considered to be 224,595 tonnes/annum. LRQA confirmed the value as below:

Parameter	Value	Source of confirmation
Production capacity of MBF-	700 tonnes of metal per day	Technical specifications of MBF-3
Annual operational days of MBF-3	345 days	Certificate provided by the chartered engineer
Average availability of MBF-3	93%	Certificate provided by the chartered engineer

Hence $Q_{BL,product}$ = 700 x 345 x 0.93 = 224,595 tonnes/annum

$q_{wcm,product}$ is considered to be 2,179 Nm^3/ton of metal produced. LRQA confirmed the value by cross checking the technical specifications of the MBF-3.

Hence $Q_{WCM,BL}$ is calculated as 489,345,789 Nm^3/annum.

$Q_{WCM,y}$ has been considered to be same as $Q_{WCM,BL}$ for ex-ante calculations. However $Q_{WCM,y}$ will be determined ex-post based on actual monitored data for purpose of calculation of emission reductions.

Determination of f_{WCM}:

As the boiler is a dual fuel fired boiler capable of firing a mix of blast furnace gas as well as furnace oil, direct measurement of electricity generated by surplus blast furnace gas is not feasible. LRQA confirms the situation-1 is appropriate for estimating f_{WCM} for calculation of baseline emissions.

As per Situation-1 calculation of the energy generated (electricity) in units supplied by WECM (surplus blast furnace gas) and other fuels (furnace oil) is as given below:

$$f_{WCM} = \frac{\sum_{h=1}^{8760} Q_{WCM,h} \times (Cp_{wcm} \times (t_{wcm,h} - t_{ref}) + NCV_{WCM,y})}{H_r} \Big/ EG_{tot,y}$$

The average heat rate of the power plant will be calculated as:

$$H_r = \frac{\sum_{h=1}^{8760} \sum_{i=1}^{I} Q_{i,h} \times (Cp_i \times (t_{i,h} - t_{ref}) + NCV_i)}{EG_{tot,y}}$$

However, as per the methodology, in case the index 'i' represents fuel, the energy content corresponding to the sensible heat of fuel 'i' is to be considered as zero. As both surplus blast furnace gas as well as furnace oil is being used as fuel in the

project activity, the energy content corresponding to the sensible heat of both the fuel are considered to be zero.

Hence, $(Q_{i,h} * (Cp_i * (t_{i,h} - t_{ref}) = 0)$

LRQA confirms that both surplus blast furnace gas as well as furnace oil are being used as fuel in the dual fuel fired boiler. The project activity intends to utilise the calorific value of the surplus blast furnace gas. Hence it is justified to consider the energy content corresponding to the sensible heat of both fuels as zero.

Therefore, f_{WCM} is determined as below:

$$f_{WCM} = \frac{\sum_{h=1}^{8760} Q_{WCM,h} \times NCV_{WCM,y}}{H_r} \Big/ EG_{tot,y}$$

While Hr is calculated as per:

$$H_r = \frac{\sum_{h=1}^{8760} \sum_{i=1}^{I} Q_{i,h} \times NCV_i}{EG_{tot,y}}$$

Q_{WCM} is derived as 63,548 Nm^3/hour based on the estimated blast furnace gas generation from MBF-3 and consumption in hot stoves. LRQA confirmed the same from the technical specifications of the MBF-3 and certificate from chartered engineer.

$NCV_{WCM,y}$ is calculated as 2.675 x 10^{-6} TJ/Nm^3. LRQA confirmed the calorific value of the blast furnace gas from gas analysis report from independent laboratory. The calorific value of blast furnace gas was determined as an average of four samples collected on four days[19] to be 640 kcal/Nm^3 and hence considered appropriate.
Hence the $NCV_{WCM,y}$ = 640 kcal/Nm^3 x 4.18 / 10^9 = 2.675 x 10^{-6} TJ/Nm^3.

$EG_{tot,y}$ is calculated by converting the estimated electricity generation to energy basis and is determined to be 379 TJ/year.

The validation team confirmed the correctness of the total furnace consumption on the basis of consumption under (i) normal conditions (1166t/annum), (ii) due to fluctuations in BFG supply (63.36 t/annum) and (iii) during shut down period of blast furnace (2893 t/annum). This totals 4123 t/ annum, i.e. 0.491 t/h considering 350 operational days of the power plant, 345 operational days of Blast Furnace and 93% availability of blast furnace gas.

[19] Certificate of analysis from Premier Analytical Laboratories confirming the constituents and calorific value of blast furnace gas dated 18/06/2008

NCVi relating to furnace oil = 0.0418 TJ/ton; based on the calorific value of the furnace oil (10000 kcal/kg)

Hr = (63,548 Nm^3/hr x 345 d x 0.93 x 24 hr/d x 2.675 x 10^{-6} TJ/Nm^3) + (0.491 t/hr x 24 hr/d x 350 d x 0.0418 TJ/t)/ 379
= 1481.4289 TJ

Hr = 3.90

The average heat rate of the power plant (Hr) is determined as 3.9. Hr is a calculated value based on the energy generated by power plant and the energy input from the surplus blast furnace gas and furnace oil.

Therefore fwcm = $\frac{63,548\ Nm^3/hour \times 345 \times 0.93 \times 24 \times 2.675 \times 10^6\ TJ/Nm^3}{3.9/\ 379}$

Fwcm = 0.88

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

As the project activity intends to displace electricity from the grid, the CO_2 emission factor for the electricity source i (*i.e.* $EF_{elec,i,j,y}$ = $EF_{elec,gr,j,y}$) is to be determined following the guidance provided in the 'Tool to calculate the emission factor for an electricity system'.

The baseline EF is to be calculated as a CM consisting of OM and BM factors based on data from an official source made publicly available. The PP uses the EF for the grid electricity as calculated in CO_2 Baseline Database for the Indian Power Sector published by the Central Electricity Authority (CEA), Ministry of Power, Government of India. The CEA publishes on annual basis the General Review and the Performance Review of Thermal Power Stations that have been the data sources used by the most CDM project developers. The database for baseline estimation issued by the CEA has been developed consistently with the availability of data in India. The database is an official publication of the Government of India for the purpose of CDM baselines.

The CEA Database version 03 has been applied since it was current at the time of submission of the CDM-PDD for validation that commenced on 10th July 2008.
http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver3.zip

LRQA confirmed that the PP applied the calculations specified in the step-wise approach of *the tool* to the publicly available database and confirmed that the OM & BM reported in the database as correct.

Step 1 of *the tool* requires identification of the relevant electric power system. In line with the requirements specified in *the tool*, the PP has used a regional grid definition applicable for large countries like India with layered dispatch systems. Historically, the Indian power system was divided into five independent regional grids, namely Northern, Eastern, Western, Southern, and North-Eastern. Each grid covered several states.

The southern grid covers four states and two Union Territories including the state of Tamil Nadu, where the project activity is located and hence its selection for the purpose of estimation of baseline emission factor is considered appropriate. Therefore, LRQA confirms the applicability of Step 1 of *the tool*.

For the purpose of determining the operating margin emission factor, the CEA database applies a simple operating margin emission rate of the exporting grid. This is acceptable given that the conditions described in Step 3 of the tool are complied by the exporting grid.

For imports from connected electricity systems located in another host country(ies), the emission factor is 0 tons CO2 per MWh.

The PP have chosen to consider only grid connected power plants as per the choice offered by Step 2 of the tool in determining the operating margin. This is considered acceptable.

Step 3 of *the tool* requires selecting an operating margin method. Of the four methods provided in *the tool* for calculating the operating margin ($EF_{grid,OM,y}$). The PP has selected a simple OM method. *The tool* specifies that the simple OM method can only be used if the low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The Simple OM method selected by the PP is justified and appropriate as the average of the five most recent years low-cost/must run resources is less than 50% of total grid generation for southern zone (i.e. 2002-03 - 18.3%, 2003-04 – 16.2%, 2004-05 – 21.6%, 2005-06 – 27% and 2006-07 – 28.3%). Low-cost/must run resources include power generation through hydro and nuclear. Coal is pre-dominant fuel source but not obviously used as must-run in India where by any chance the coal based generation is displaced by less GHG emitting sources.

The tool provides two options of data vintage i.e. (i) ex-ante option and (ii) ex-post option in calculating the simple OM. The PP has chosen the ex-ante option for determining the OM. This choice of ex-ante option which is based on a 3-year generation-weighted average based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation was found acceptable in view of the availability of the requisite data vintages.

Step 4 of *the tool* requires the calculation of the operating margin emission factor according to the selected method. 'Selected method' in this context is the 'simple OM' chosen in Step 3.

LRQA confirmed that the source of data was from CEA database version 03 which uses a weighted average emissions rate of all thermal stations in the regional grid in accordance with Option A of the tool to calculate the emission factor of an electricity system. The calculations presented in the CER spreadsheet presented by the PP with respect of 3-year generation weighted average OM emission factor for the Southern Region (SR) Grid was correctly calculated as 1.0039.

Step 5 of *the tool* requires the identification of the cohort of the power units to be included in the build margin. The CEA database has selected the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The calculations are based on generation, fuel consumption and fuel quality data obtained from the power stations.

In validating this step, LRQA confirmed that
(i) the identified power capacity additions comprise 20% of the system generation for the year under consideration.
(ii) none of the considered power capacity additions considered under (i) above have been built more than ten years earlier.

Step 6 of *the tool* requires calculation of the build margin emission factor.

The CEA database provides a BM value for the Southern grid as 0.7054 tCO_2/MWh. As part of validation of Step 5 of the tool, LRQA confirmed through independent calculations the BM for the year 2006-07 as per the following summary:

Year	Absolute emissions tCO_2	Net Generation GWh	Specific emissions (tCO_2/MWh) BM
2006-07	21,475,360	30,442	0.7054

Step 7of *the tool* requires calculation of the combined margin emission factor as per the following equation:

$EF_{,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$

According to the guidance on selecting alternative weights in *the tool,* the default weights applicable for the project are $w_{OM} = 0.50$ and $w_{BM} = 0.50$.

Hence
$EF_{,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$
$= 1.0039 \times 0.50 + 0.7054 \times 0.50 =$ **0.8546 tCO_2/MWh**

Project Emissions

For the project activity under consideration, there is provision for use of LPG in the pilot burner. PP will monitor the consumption of the fuel to determine the project emissions which will be considered while computing the *ex-post* emission reductions resulting from the project activity.

The project emissions from use of fossil fuels will be calculated as below:

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

For ex-ante purposes, the project emissions are considered as zero.

Also in the project activity no additional blast furnace 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

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

As specified in the methodology if the electricity source for this supplementary consumption is from grid, combined emission factor should be used according to the latest approved version of the "Tool to calculate the emission factor for an electricity system"

As detailed above, an ex-ante grid emission factor of 0.8546 tCO_2/MWh shall be used for calculating the project emissions arising from supplementary electricity consumption from grid.

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

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

The project will reduce emissions which are real and measurable. The project is expected to result in emission reductions of approximately 71581 tCO2 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.

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 the 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.

However, the following issues were raise during validation and subsequently closed,

CAR 12
Section B.6.1 of PDD version 01 mentions that "there is no provision for auxiliary fossil fuel firing in the Gas Fired Boiler to supplement the heat content of the waste gas". However, during validation site visit it was known that FO will be used for supplementing the heat content due to the fluctuations in the BF gas supply, while LPG was being utilised for generating pilot flame in the boiler. As the same are not accounted for calculation of ex-ante project emissions, LRQA raised CAR 12.
LRQA confirmed that FO will be used in the BFG boiler for start up of boiler, as supplementary fuel and as primary fuel during non-availability of BF gases. The project emissions from FO/LPG use have been appropriately considered in calculations of emission reductions submitted along with revised PDD. The project emissions arising from use of furnace oil are accounted while calculating f_{WCM}. The LPG consumption for pilot flame will be monitored ex-post for calculating the project emissions and emission reductions. Hence CAR 12 was closed.

CAR 13
Although Situation 1 described in ACM0012 ver 3.2 is more appropriate for calculating f_{WCM} given the fact that furnace oil is co-fired along with waste gases in same boiler, PDD version 01 applied Situation 2. Subsequently, PP revised PDD so as to apply situation 1 for determining f_{WCM} and updated the relevant sections B.6.1, B.6.2, B.6.3 and B.7.1. Hence CAR was closed.

CAR 14
As section B.6.1 of PDD version 01 did not explain and justify all relevant methodological choices used to calculate the grid emission factor CAR 14 was raised. PP submitted revised PDD detailing the stepwise approach as per 'Tool to calculate the emission factor for an electricity system'. LRQA confirmed the application of the tool and closed the finding.

CAR 15
Section B.6.2 of PDD version 01 did not include the parameters $Q_{BL,product}$ and $q_{wg,product}$ which are determined ex-ante as per the methodological requirements. Hence CAR 15 was raised. PP presented the parameters as part of section B.6.2 of revised PDD. LRQA confirmed the parameters $Q_{BL,product}$ and $q_{wg,product}$ from the technical specifications of the MBF and certificate from independent chartered engineer.

During completeness check, following query was raised:

Comment 1

The PDD submitted for global stakeholder consultation indicated an annual emission reduction of 64,477 tCO2e and the PDD submitted for registration indicates an annual emission reduction of 71,581 tCO2e. The DOE should indicate how it has validated this increase of ERs from PDD-GSC to the PDD-Registration.

Clarification

The PDD-GSC (PDD ver 1.0) and the PDD-Registration (PDD ver 7.0) had applied the following equation in calculation of the Baseline emissions:

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

The table below presents the values of various parameters considered in the spreadsheet for calculating emission reductions by the PP at the GSP stage (PDD ver 1.0) and at RfR stage (PDD ver 7.0).

Changes in Assumptions for Emission Reduction Computation (ER_y)				
Parameter	Notation	PDD ver 1.0	PDD ver 7.0	Remarks
Changes in Assumptions for Baseline Emission Computation (BE_y)				
Energy that would have been produced in project year y using waste energy (i.e. surplus BFG) generated in base year expressed as a fraction of total energy produced using waste source in year y	f_{cap}	1	1	There is no change in f_{cap} determination in the PDD for GSP and in the PDD for Registration.
Fraction of total electricity generated by the project activity using waste energy (i.e. surplus BFG)	f_{wcm} / f_{WG}	1	0.88	Although, furnace oil is co-fired along with blast furnace gas for supplementing the heat content, the PP had not considered this initially at the GSP stage in estimating fwcm. CAR 13 was therefore raised and resolution of this finding resulted in recalculation of fwcm to 0.88.
Quantity of electricity supplied to the recipient j by generator, that in the absence of the project activity would have been sourced from the ith source (*i.e.* the Southern Regional Grid) during the year y	$EG_{i,j,y}$	89011 (MWh)	94779 (MWh)	In the PDD-GSC EGi,j,y was computed based on effective power supply after accounting for auxiliary steam consumption and auxiliary electricity generation. The Annual operation of the power plant considered was 320 days which works out to 89011. LRQA sought clarification vide item 3 of CL 4 since the technical specifications of MBF showed that it can operate 350 days in a year. In resolving this CL, the PP revised the recalculated the electricity generation to 94779 MWh considering 345 operational days for the MBF. Refer closure of CL 4.
CO_2 emission factor for the electricity source i (*i.e.* the Southern	$EF_{elec,i,j,y} = EF_{elec,gr,j,y}$	0.8524 tCO_2/MWh	0.8546 tCO_2/MWh	In the PDD-GSC, the PP had considered the CO_2 emission factor for Southern Regional Grid has

Changes in Assumptions for Emission Reduction Computation (ER_y)				
Parameter	Notation	PDD ver 1.0	PDD ver 7.0	Remarks
Regional Grid), displaced due to the project activity during the year y				been considered from the 'Baseline Carbon Dioxide Emission Database' published by the Central Electricity Authority (CEA), Government of India. The 'Operating Margin Emission Factor' and 'Build Margin Emission Factor' as published in this database rounded off to 4-decimal place. With this method, the factor has been validated to be 0.8542 tCO_2/MWh, however the same was mistyped as 0.8524 tCO_2/MWh in the PDD-GSC. LRQA raised CAR 14 with respect of the application of the stepwise methodology given in the tool to calculate the emission factor of an electricity system'. Resolution of this finding resulted in correction of the simple average used to calculate the operating margin emission factor to the weighted average method in calculation of the operating margin emission factor and the resultant revised combined margin emission factor to 0.8546.
Baseline Emissions (tCO_2/year)	BE_y	75,873	71,581	Calculated following the methodological guidelines and hence this justifies the difference in Baseline Emissions, as reported in the PDD for GSC and PDD for Registration.

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

Changes in Assumptions for Emission Reduction Computation (ER_y)				
Parameter	Notation	PDD ver 1.0	PDD ver 7.0	Remarks
Changes in Assumptions for Project Emission Computation (BE_y)				
Quantity of fossil fuel type i combusted to supplement waste energy in the project activity during the year y	$FF_{i,y}$	2675 (tonnes/year)	0 (tonnes/year)	In the PDD-GSC, the PP had considered a consumption of furnace oil in calculating PE. This was incorrect, since, furnace oil is used only to co-fire along with Blast Furnace gas and therefore more appropriately to be considered under f_{wcm} LRQA therefore raised two findings, CAR 12 and CAR 13. In resolution of the finding, PP considered furnace oil consumption to be 'zero'. The

				term is retained in the section B.7.1 of the PDD-Registration as a check during the monitoring phase that furnace oil is not used for any other purposes other than co-firing.
Net calorific value of the fossil fuel type i combusted as supplementary fuel	NCV_i	0.043 TJ/ton	0.0418 TJ/ton	There is no change in NCV_i assumption in the PDD for GSC and in the PDD for Registration. This is assumed from '2006 IPCC Guidelines for National Greenhouse Gas Inventories'.
CO_2 emission factor per unit of energy of the fuel type i	$EF_{CO2,i}$	77.4 (tCO_2/TJ)	77.4 (tCO_2/TJ)	There is no change in $EF_{CO2,i}$ assumption in the PDD-GSC and the PDD-Registration. This is assumed from '2006 IPCC Guidelines for National Greenhouse Gas Inventories'.
Project Emissions (tCO_2/year)	PE_y	8,903	0	Calculated following the methodological guidelines and hence this justifies the difference in Project Emissions, as reported in the PDD for GSC and PDD for Registration.

$$ER_y = (BE_y - PE_y)$$

Emissions Reductions (tCO_2/year)	ER_y	66,970	71,581	

Although, the GSP PDD had reported ex-ante ER of 64,477 tCO_2e, the initial ER calculation spreadsheet submitted by PP showed 66,970 tCO_2e.

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 3.2). The monitoring plan is documented according to the applied methodology. It provides for the collection an 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 6.0.

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.

- Quantity of the surplus blast furnace gas consumed by in the project activity ($Q_{WCM,y}$) would be monitored continuously before entering into the boiler with help of continuous flow meter
- Net calorific value of surplus blast furnace gas ($NCV_{WCM,y}$) will be

monitored on monthly basis with help of orsat apparatus

- Amount of individual fuels (i) surplus blast furnace gas and (ii) furnace oil consumed in the boiler will be monitored continuously with flow meter
- Net calorific value of the individual fuels will be analysed once in a month
- Electricity generated (gross and net) and supplementary electricity consumed will be measured on continuous basis with help of electronic meters

The measuring equipments mainly flow meters and energy meters will be subject to annual calibration. 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 7.0.

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.

However, the following issue was raise during validation and subsequently closed,

CAR 16
As section B.7 of PDD version 01 did not provide detailed QA/QC procedures for the monitoring parameters, CAR 16 was raised. PP submitted revised PDD detailing the QA/QC procedures to be applied for the Data/Parameters to be monitored. Hence CAR 16 was closed.

4.6 Duration of the project activity / crediting period

The PDD mentions the start date of the project activity as 01st June 2007 and the operational lifetime is expected for 15 years.

The date 01st June 2007 corresponds to the advance payment made to the boiler supplier 'ISGEC John Thompson' for supply of boiler and auxiliaries. The supporting evidence was reviewed by the validation team and same can be considered as the date on which the PP has committed to expenditures related to the implementation of the project which is in accordance with CDM Glossary of terms. LRQA confirmed that 01st June 2007 is the earliest date of real action by reviewing the purchase orders issued to the technology suppliers (boiler and turbine), for civil construction, blast furnace gas ducting and for the mechanical works for which the PP had committed expenditures.

Operational life of 15 years is considered reasonable. The same was verified from the operational lifetime of boiler, steam turbine generator and MBF-3 as provided by the respective suppliers (for boiler and steam turbine generator) and the technical consultant (for MBF-3).

The PP has selected the 10 years fixed crediting period. The starting date of crediting period is 01/12/2011 or project's registration date as a CDM project

activity. However, the crediting period may only start after the date of registration of the proposed activity as a CDM project activity.

However, the following issues were raised during validation and subsequently closed.

CAR 17
CAR 17 was raised as section C.1.1 of PDD version 01 did not describe the evidence available to support the stated start date. The date of advance payment to ISGEC John Thompson for supply of boiler - 01/06/2007 has been considered as the start date for the project activity. LRQA confirmed that 01st June 2007 is the earliest date of real action by reviewing the purchase orders issued to the technology suppliers (boiler and turbine), for civil construction, blast furnace gas ducting and for the mechanical works for which the PP had committed expenditures. Hence CAR 17 was closed.

CAR 18
PDD version 1.0 mentioned the start date of crediting period as 09/05/2007; however start date of crediting period cannot be prior to date of registration. Hence CAR was raised. The revised PDD mentions the start date to be 01/12/2011 or date of registration of the project activity, whichever is later. The change was found to be appropriate and hence CAR was closed.

4.7 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. As required by the EIA notification of 2006[20] a public consultation had already been conducted for the project activity. The State level Environmental Impact Assessment Authority of Karnataka has granted environmental clearance on 28th April 2008. Necessary licenses and environmental clearances have been obtained. (Refer Appendix B for details of the consents and clearances obtained for the project).

4.8 Stakeholders' comments

The PP communicated about the project activity through written notification and requested the stakeholders to provide their feedback. Local stakeholders

[20] http://envfor.nic.in/legis/eia/so1533.pdf

included company employees, villagers and local people, contractors and contract employees.

Review of the Stakeholder meeting minutes held on 17th July 2007 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 were invited for the local stakeholder consultation meeting. They also confirmed that the PP representative had given a brief introduction about the concept of CDM and the project activity in national (Hindi) as well as local (Kannada) language. The copy of notices sent to inform stakeholders about the project activity on 14th May 2007 were reviewed. Apart from this the contactors and employees were also informed verbally about the proposed meeting. The local stakeholder consultation meeting was held on 17th July 2008 which confirmed that reasonable time was given to comment on the project. The same was confirmed during the validation visit by interviewing the stakeholders.

During the site visit conducted in October 2008 and subsequently in April 2009, LRQA met a selection of the stakeholders to confirm the local stakeholder consultation process. The stakeholders confirmed their presence in the stakeholder meet held by the PP and that they had no concerns with respect of the project activity. Rather, some of the stakeholders expressed that the project provided the employment opportunities during the construction phases and potential employment during operation of the project activity.

LRQA confirms that the local stakeholder consultation was adequate with respect of identification of local stakeholders, seeking their views and taking due account of any comments and conducted in a transparent manner.

CAR 19
Section E of the PDD version 01 did not detail the stakeholder consultation process, hence CAR was raised. PP updated section E in revised PDD so as to clearly document the local stakeholder consultation process. LRQA confirmed the local stakeholder process from interviews during the site visit. Therefore, the finding has been closed. (Ref: Appendix F of the validation report)

5 Comments by parties, stakeholders and NGOs

In accordance with the requirement of the Procedures for Processing and Reporting on Validation of CDM project activities, 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 10 July 2008 - 08 August 2008 (https://cdm.unfccc.int/Projects/Validation/DB/7CR7317YZ4BZ6S1INPMZMU3JONA8DC/view.html).

No comment was received during this period.

6 Validation Opinion

LRQA has undertaken the validation of the proposed project activity, "Power generation by utilizing Blast Furnace Gas at Mukand Limited, Ginigera, Karnataka" 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.

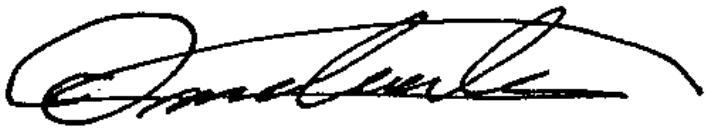
In order to arrive at the final validation conclusions and opinion, LRQA carried out document review of the PDD and related information, site visit, interview with PP, stakeholders and cross-check of evidences through alternate sources and independent reviews.

Through the process of validation the team has identified 19 CARs and 4 CLs. The PP has taken actions and submitted to LRQA the revised PDD Version 7.0 and the other supporting evidences. These were reviewed and the findings were closed out. Overall conclusion for the project activity has been briefly summarized below:

- The PP has correctly applied ACM0012- "Consolidated baseline methodology for GHG emission reductions from waste energy reductions from waste energy recovery projects" (Version 3.2) to the project activity that utilises surplus (waste) blast furnace gas for 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 project IRR for the project case was lower than the WACC benchmark 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 conforms to 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 "Power generation by utilizing Blast Furnace Gas at Mukand Limited, Ginigera, Karnataka" to the CDM Executive Board as a CDM project activity.

Decision Maker



Michiaki Chiba
Climate Change Manager - Asia and Pacific

7 Appendices

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

Letter of Approval from National Clean Development Mechanism Authority dated 03 September 2008

7.2 Appendix B: List of documents reviewed

Category A documents (documents prepared by the PP)

1. The CDM-PDD for "Power generation by utilizing Blast Furnace Gas at Mukand Limited, Ginigera, Karnataka" Version 01 dated 28/05/2008, Version 02 dated 19/02/2010, Version 03 dated 07/05/2010, Version 04 dated 05/06/2010; Version 05 dated 08/10/2010 and Version 06 dated 02/11/2010; version 07 dated 27/08/2011.
2. Emission Reduction calculation spreadsheet (Electronic Copy)
3. Investment Comparison spreadsheet (Electronic Copy)
4. Consent for establishment of MBF-3 granted by Karnataka State Pollution Control Board dated 22/10/2007
5. Consent for establishment of 15 MW power plant granted by Karnataka State Pollution Control Board dated 11/09/2008
6. Environmental clearance for expansion of steel plant capacity granted to Kalyani Steels Limited by Ministry of Environment and Forests dated 27/12/2007
7. Environmental clearance for establishment of 15 MW power plant by Mukand Ltd. granted by State level environment impact assessment authority, Karnataka dated 28/04/2008
8. Sample skill matrix for employees dated 20/06/2008
9. Contract agreement between Mukand Ltd. and Fichtner Consulting Engineers (India) Pvt. Ltd. for providing design, engineering and consultancy services for the project activity dated 20/10/2006
10. Furnace oil bill from Hindustan Petroleum Corporation Limited dated 19/05/2006
11. Insurance quotations for the power plant as received from Bajaj Allianz
12. Income tax ready reckoner for assessment year 2006-07
13. All India consumer price index (general) for industrial workers for the period 1997-98 to 2006-07
14. Yearly wholesale price index for 'all commodities' for the period 1997-98 to 2006-07
15. Yearly wholesale price index for 'electrical industrial machinery' for the period 1997-98 to 2006-07
16. Yearly wholesale price index for 'electricity for industry' for the period 1997-98 to 2006-07
17. Yearly wholesale price index for 'furnace oil' for the period 1997-98 to 2006-07
18. Site layout diagram
19. Process flow diagram for the proposed project activity
20. Piping and instrumentation (P&I) diagram for fuel firing system in the dual fuel fired boiler

21. Letter form ISGEC John Thompson to Mukand Ltd. confirming the lifetime of the boiler
22. Letter from Qingdao Jieneng Power Station Engineering Co. Ltd. to Mukand Ltd. dated 28/08/2008 confirming the lifetime of the steam turbine generator
23. Certificate from MECON Limited dated 13/08/2008 confirming the lifetime of the MBF-3
24. Electricity bills for the years 2005, 2006 and 2007
25. Data of hot metal production from MBF-1, MBF-2 and MBF-3 for the period April 2008 to November 2008
26. Data of blast furnace consumption in the existing power plant of KSL for the period April 2008 to November 2008
27. Data of electricity generation from the existing power plant of KSL for the period April 2008 to November 2008
28. Advance payment to ISGEC John Thompson for supply of boiler and auxiliaries dated 01/06/2007
29. Purchase Order issued to ISGEC John Thompson for supply of boiler and auxiliaries dated 29/01/2008
30. Purchase Order issued to Qingdao Jieneng Power Station Engineering P. Ltd. for supply of steam turbine generator and its auxiliaries dated 10/07/2008
31. Purchase order issued to Suprada constructions company for civil and structural jobs dated 30/11/2007
32. Purchase order issued to APT Power EPC Limited for mechanical works dated 14/07/2008
33. Purchase order issued to Rockwell automation India Pvt. Ltd. for design, engineering and commissioning of automation system dated 13/03/2008
34. Newspaper cutting informing stakeholders on receiving the environmental clearance for the 15 MW blast furnace gas fired power plant
35. Letter from Mukand Ltd. dated 14/05/2007 to employees, contractors, local people and suppliers informing about the proposed project activity and inviting feedback/comments.
36. Notice dated 18/06/2007 from Mukand Ltd. informing on proposed stakeholder meeting
37. Minutes of stakeholder consultation meeting held on 27/07/2007
38. Attendance record of local stakeholders
39. Technical specifications of the blast furnace gas/FO firing system (Ref: JB0703-50450200-SPC-001, rev 00)
40. Technical specifications of Mini Blast Furnace-3
41. Certificate from ISGEC John Thompson confirming the auxiliary steam requirement for oil pre-heater, steam tracing and atomising of furnace oil
42. Note from APT power engineering limited confirming the auxiliary steam requirements for utilities
43. Test report by Premier analytical laboratories for blast furnace gas dated 18/06/2008
44. Report by Haribhakti group for Beta of steel industries
45. Chartered engineer certificate dated 19/05/2009
46. Commissioning certificate dated 14/05/2008 confirming the commissioning of MBF-3 of 29/03/2008
47. Gas balance diagram for MBF-1, MBF-2 and MBF-3
48. Guaranteed specifications for the steam turbine generator
49. Breakup of power requirement at Hospet Steel Plant
50. Application letter to Ministry of Environment and Forests (MoEF) for host

country approval dated 28/05/2008
51. Extract of Environmental Impact Assessment report
52. Certificate from Chartered Accountant (ref no. ML/CPP/PC) certifying the actual project cost incurred till 14/03/2010 and the expected value to be incurred for completion of project implementation
53. Certificate from Chartered Accountant (ref no. ML/CPP/ADM) certifying the cost for administrative expenses for the project activity
54. Extracts of the minutes of the meeting of the board of directors of mukand Limited held on 22/05/2007
55. Agreement for use of off-gases entered between Mukand Limited and Kalyani Steels Limited dated 30/09/2009
56. Engagement letter issued by Mukand Ltd. to Ernst & Young Pvt. Ltd. dated 04/10/2007 for CDM advisory services

Category B documents (other documents referenced)

1. ACM0012- "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" (Version 3.2)
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. Tool for the demonstration and assessment of additionality (version 5.2)
5. Tool to calculate the emission factor for an electricity system (version 1.1)
6. Guidelines on the Assessment of Investment Analysis (version 03.1)
7. Guidelines on the demonstration and assessment of prior consideration of the CDM (version 03)
8. Clean Development Mechanism Validation and Verification Manual (version 01.1)
9. Eligibility Criteria for Host Country Approval, National CDM Authority, Ministry of Environment & Forests
10. Notification by Ministry of Environment & Forests dated 14th September 2006
11. Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2004.
12. Information note: Previous rulings related to the appropriateness of benchmarks for project activities utilizing waste heat/waste gas for power Generation (EB 51 Annex 59).

7.3 Appendix C: List of persons interviewed

Mr. Virendra Mital, Director - Business Development, Mukand Limtied

Mr. Surendra Pai, Finance, Mukand Limited

Mr. Saunak Saha, Consultant, Ernst & Young Pvt. Ltd.

Mr. Suddhwasattwa Mukherjee, Consultant, Ernst & Young Pvt. Ltd.

Dr. Manish Shakdwipee, Consultant, Ernst & Young Pvt. Ltd.

Mr. Bhupendra Verma, Consultant, Ernst & Young Pvt. Ltd.

Mr. Pandurangappa Naik, Contractor- Housekeeping

Mr. Nagaraj, Steel Contractor

Mr. Amaresh, Contractor & villager

Mr. Anil Kumar Methi, Contractor

7.4 Appendix D: How due account has been taken to the public input made to the validation requirements

The PDD was made publicly available in accordance with the requirements of the Procedures for processing and reporting on validation of a CDM project activity for the period of 10 July 2008 - 08 August 2008 as per https://cdm.unfccc.int/Projects/Validation/DB/7CR7317YZ4BZ6S1INPMZMU3JONA8DC/view.html.

No comment was received during this period.

7.5 Appendix E: Certificate of Appointment

Validation of "Power generation by utilizing Blast Furnace Gas at Mukand Limited, Ginigera, Karnataka"

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.

Ketan S. Deshmukh	LRQA Asia	Team leader
Imran Ustad	LRQA Ltd. India	Team member
A V Shivaramakrishnan	LRQA Ltd. India	Sector expert
P R N Rao	LRQA Ltd. India	Team member
Avinash Lonkar	External expert	Sector expert
Prabodha C Acharya	LRQA Ltd. India	Technical reviewer
Stewart Niu	LRQA China	Sector expert to technical review
Michiaki Chiba	LRQA Ltd.	Decision Maker

Signed by

Decision Maker
Michiaki Chiba
Climate Change Manager - Asia and Pacific

7.6 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	The Project description as given in section A.2 of the PDD does not describe the following: (a) The scenario existing prior to the start of the implementation of the project activity; (b) The project scenario, including a summary of the scope of activities/measures that are being implemented within the proposed project activity.	PP provided revised PDD so as to include the description on the scenario existing prior to the project activity start date and the scope of activities implemented within the proposed project activity. LRQA confirmed that the surplus blast furnace gas would have been flared in the absence of the project activity, while the electricity would have been sourced from the southern regional grid system. The project activity measures were confirmed from the site layout diagram, technical specifications of the equipments and site visit. Hence the CAR was closed.	Project Activity/PDD/A.2	13 Jan 09	CAR 1	Para. 35 CDM M&P
CAR	Closed	Following elements required as per the "Guidelines for completing CDM-PDD" have not been filled in section A.4.3. • Purpose of the project activity • The scenario existing prior to the start of the implementation of the project activity, with a list of the equipment(s) and systems in operation at that time; • The baseline scenario, as identified in section "B.4 Description of how the baseline scenario is identified and description of the identified baseline scenario", with an indicative list of the equipment(s) and systems that would have been in place in the absence of the project activity. • List and the arrangement of the main manufacturing/production technologies, systems and equipments involved including the information about average lifetime of the equipments based on manufacturer's specifications, industry standards, load factors and efficiencies. • The emission sources and the greenhouse gases	Section A.4.3 of the revised PDD includes the relevant details as required by the guidelines for completing CDM-PDD. LRQA validated the same through document review of the technical specifications provided by the manufacturer, site layout diagram and validation site visit.	Technology to be employed/ /PDD/A.4.3	13 Jan 09	CAR 2	Para. 35 CDM M&P & 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
		involved in the project activity • 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 equipments and systems outside the project boundary. • Explanation of how the same types and levels of services provided by the project activity would have been provided in the baseline scenario.					
CAR	Closed	Although the Applicability of ACM0012 ver 03 requires that the waste gas/pressure is flared or released into the atmosphere in the absence of the project activity at the facility, the following was noted during the site visit: 1. Waste gas utilisation related to power generated through another registered power project (Ref No. 0427) that normally uses BF gases from MBF-1 and MBF-2 shows that the BF gases from MBF-3 were partially utilised in generating power in the months of Aug-Oct 2008 and fully utilized in the month of Nov 2008 when MBF-1 and MBF-2 were not in operation. 2. An interconnecting BF pipeline from MBF-3 leading to the registered project activity was sighted.	(1) LRQA analysed the BF gas usage data for the existing project activity and could confirm that the BF gas from MBF-1 and MBF-2 at normal operations were sufficient to cater the demands of the present project activity (ref no. 0427) with a small portion of BF gases being flared. (2) At the time of investment decision making, utilisation of MBF-3 waste gas in the existing power plant (9 MW) was not envisaged and the decision making clearly presented the need of a new power plant of 15 MW capacity. (3) LRQA confirmed that the connection was removed through a second site visit held during 31/03/09 to 01/04/09. LRQA confirmed that the Waste Energy Carrying Medium i.e. surplus blast furnace gas would have been flared in the absence of the project activity.	Technology to be employed/ /PDD/A.4.3 Justification of choice of methodology/PDD/B.2	13 Jan 09	CAR 3	Para. 35 CDM M&P, Para. 37 (e) CDM M&P & 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
CAR	Closed	The project boundary does not include: 1. Import of grid electricity for supplementary consumption for auxiliary start-up and 2. Consumption of LPG in pilot burner of boiler Also, the "guidelines for completing CDM-PDD ver 7 requires to present a flow diagram of the project boundary, physically delineating the project activity including all the equipments, systems, flows of mass and energy, emissions sources and gases and the monitoring variables.	Project boundary diagram under section B.3 of the revised PDD includes the provision for supplementary grid electricity consumption, LPG and FO consumption in pilot burner. The diagram also presents the metering locations which were found to be appropriate. The relevant emission sources and gases are presented in the table which are appropriate to the project activity and in line with the requirements of ACM0012 version 3.2	Project boundary/PDD/B.3	13 Jan 09	CAR 4	Para. 37 (e) CDM M&P
CAR	Closed	PDD states that "The source of waste gas (BF gas), is the outlet of the Mini Blast Furnace of the Steel Plant of Mukand Ltd. Thus Mukand Ltd. is the generator of waste energy." However, document review of the environmental consent indicates that the 350m^3 MBF is owned by Kalyani Steels Ltd (KSL) and therefore, KSL is the generator of waste gas.	Section B.3 of the PDD has been revised to include the source of BF gas - MBF-3 owned by Kalyani Steels Limited. LRQA could confirm the gas sharing agreement from the letter jointly signed by KSL (waste gas generator) and ML (generator of electricity and recipient plant) stating that the BF gas from MBF-1 and MBF-2 will be exclusively used by KSL for power generation while the BF gas from MBF-3 will be exclusively used by ML for the 15 MW power plant.	Project boundary/PDD/B.3	13 Jan 09	CAR 5	Para. 37 (e) CDM M&P
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. Also please provide the evidence for the statement in footer 6 and 7.	PP revised the PDD to reflect the various steps detailed in the applied methodology. LRQA confirmed that the baseline scenario was identified in accordance with the methodology and closed the CAR	Details of baseline and its development/PDD/B.4	13 Jan 09	CAR 6	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	Section B.4 does not detail how Step 3 of the methodology has been applied which requires application of Step 2 (Investment analysis) and/or step 3 (Barrier analysis) of the latest approved version of the "Tool for the demonstration and assessment of additionality" to identify the most plausible baseline scenarios by eliminating non-feasible options.	PP revised the PDD and applied Step 3 of the applied methodology including the application of "Tool for the demonstration and assessment of additionality". The validation team confirmed that the Step3 was correctly applied and closed the CAR.	Details of baseline and its development/PDD/B.4	13 Jan 09	CAR 7	Para. 37 (e) CDM M&P
CAR	Closed	Section B.5 does not clearly follow the step wise approach for demonstration and assessment of additionality as required by the "Tool for the demonstration and assessment of additionality". Moreover, the PDD refers version 4 of "Tool for the demonstration and assessment of additionality" which is valid upto 16th January 2009. PP is requested to apply the latest version of Additionality Tool (version 5.2)	Section B.5 of the revised PDD follows a step wise approach as per the latest version 05.2 of "Tool for the demonstration and assessment of additionality".	Additionality/PDD/B.5	13 Jan 09	CAR 8	Para. 43 CDM M&P
CAR	Closed	Please mention and justify the variables considered for performing the sensitivity analysis along with the results obtained in transparent manner. (Refer Guidelines on the Assessment of Investment Analysis version 03.1)	Sensitivity analysis has been performed on project cost, net electricity generation, power tariff, cost of FO and variable cost in accordance with para 17 and 18 of Guidelines on the Assessment of Investment Analysis version 03.1. LRQA confirmed the spreadsheets for sensitivity analysis.	Additionality/PDD/B.5	13 Jan 09	CAR 9	Para. 43 CDM M&P
CAR	Closed	Section B.5 of PDD states that installation of carbon monoxide sensors incurs high cost and therefore considered as a technological barrier. PP to justify this barrier in light of the fact that these are generally installed in all blast furnace plants including baseline scenario as a safety measure.	As the barriers presented under section B.5 could not be adequately substantiated, PP removed the same from the revised PDD. This is in line with para 117 (a) of the CDM VVM. Hence CAR was closed.	Additionality/PDD/B.5	13 Jan 09	CAR 10	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	As the starting date of the proposed project activity is earlier than the date of publication of PDD, section B.5 of the PDD should contain a description of how the benefits of CDM were seriously considered prior to the starting date and present the evidence for the same. PP to provide an implementation timeline of the proposed CDM project activity. The timeline should include, where applicable, the date when the investment decision was made, the date when construction works started, the date when commissioning started and the date of start-up (e.g. the date when commercial production started). In addition to this implementation timeline project participants shall provide a timeline of events and actions, which have been taken to achieve CDM registration, with description of the evidence used to support these actions. (Refer CDM-PDD Guidelines version 07)	PP presented the implementation timeline of the project activity. The Board of Directors decided to invest in the project activity considering CDM benefits on 22/05/2007. LRQA could confirm the CDM consideration from the 'Excerpts of the Minutes of the Meeting of the Board of Directors held on 22nd May 2007' The Consultant was appointed on 04/10/2007, while LRQA was appointed for validation services on 06/06/2008. As there is less than two years gap between the documented evidence, LRQA could conclude that continuing and real actions were taken to secure CDM status for the project activity.	Additionality/PDD/B.5	13 Jan 09	CAR 11	Para. 43 CDM M&P
CAR	Closed	Section B.6.1 (page 27) of PDD mentions that "there is no provision for auxiliary fossil fuel firing in the Gas Fired Boiler to supplement the heat content of the waste gas". However, during validation site visit it was known that FO will be used for supplementing the heat content due to the fluctuations in the BF gas supply, while LPG was being utilised for generating pilot flame in the boiler. The same are not accounted for calculation of ex-ante project emissions.	FO will be used in the BFG boiler for the following purpose: - Start up of boiler - As supplementary fuel and - As primary fuel for approx 30 days as the MBF gas will be available for 345 days The project boundary diagram under section B.3 has been updated so as to include the project emissions from consumption of FO and those from LPG use for generating pilot flame in burner. The project emissions from FO/LPG use have been considered in calculating the emission reductions. The project emissions arising from use of furnace oil are accounted while calculating fwcm. The LPG consumption for pilot flame will be monitored ex-post for calculating the project emissions and emission reductions.	Emission Reductions/PDD/B.6.1	13 Jan 09	CAR 12	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
CAR	Closed	Although Situation 1 described in ACM0012 ver 3.2 is more appropriate for calculating f_{WCM} given the fact that furnace oil is co-fired along with waste gases in same boiler, PDD has applied Situation 2 which is appropriate only in the case where steam is generated with different fuels in dedicated boilers. Section B.6.1, B.6.2, B.6.3 and B.7.1 needs appropriate correction.	The revised PDD calculates 'fWCM' as per the equation (1d) of ACM0012 version 3.2. Hence CAR was closed.	Emission Reductions/PDD/B.6.1-B.6.3 Data & Parameters monitored/ PDD B.7.1	13 Jan 09	CAR 13	Para.37(d) & 43 CDM M&P
CAR	Closed	Section B.6.1 should explain and justify all relevant methodological choices used to calculate the grid emission factor (e.g. which methodological approach is used to calculate the "operating margin" in ACM0002), explain and justify which option is chosen for the project activity. (Refer guidelines for completing CDM-PDD)	Stepwise approach as per 'Tool to calculate the emission factor for an electricity system' has been included in the revised PDD.	Emission Reductions/PDD/B.6.1	13 Jan 09	CAR 14	Para.37(d) & 43 CDM M&P
CAR	Closed	Section B.6.2 does not include the parameters $Q_{BL,product}$ and $q_{wg,product}$ as required by the methodology.	Section B.6.2 of the revised PDD includes the parameters $Q_{BL,product}$ and $q_{wg,product}$ as required by ACM0012 version 3.2. LRQA confirmed the parameters from the technical specifications of the MBF and certificate from independent chartered engineer.	Emission Reductions/PDD/B.6.3	13 Jan 09	CAR 15	Para.37(d) & 43 CDM M&P
CAR	Closed	Section B.7 of the PDD does not provide a detailed description of the QA/QC procedures to be applied for the Data/Parameters to be monitored. Correction requested.	Section B.7 of the PDD provides a detailed description of the QA/QC procedures to be applied for the Data/Parameters to be monitored.	Data & Parameters monitored/ PDD B.7.1	13 Jan 09	CAR 16	Para.37(d) & 43 CDM M&P
CAR	Open	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 date of advance payment to ISGEC John Thompson for supply of boiler - 01/06/2007 has been considered as the start date for the project activity. LRQA confirmed that 01st June 2007 is the earliest date of real action by reviewing the purchase orders issued to the technology suppliers (boiler and turbine), for civil construction, blast furnace gas ducting and for the mechanical works for which the PP had committed expenditures.	Starting date/PDD/C.1.1	13 Jan 09	CAR 17	Guidelines for completing CDM-PDD Version 07
CAR	Closed	Starting date of crediting period mentioned is 09/05/2007 which is before date of registration. Please note that the starting date of crediting period cannot be	Revised PDD states a starting date of crediting period as 01/12/2011 or date of registration whichever is later.	Starting date of crediting period/PDD/C.1.1	13 Jan 09	CAR 18	Guidelines for completing

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
		before the date of registration.					CDM-PDD Version 07
CAR	Closed	The details of the processes undertaken for inviting comments by local stakeholders are to be provided with supporting evidences. Section E of the PDD does not described how the invitation for comments by local stakeholders was made in an open and transparent manner and allowed for reasonable time for comments to be justified. Also, it is not clear how the project proponent described the project to the local stakeholders to help them understand the project activity. PP requested to provide all supporting evidences for the stakeholder consultation process.	Section E in revised PDD has been changed accordingly so as to clearly document the local stakeholder consultation process. LRQA confirmed the local stakeholder process from interviews during the site visit.	Stakeholder's comments/PDD/E	13 Jan 09	CAR 19	Para. 37 (b) CDM M&P & Guidelines for completing CDM-PDD Version 07
CL	Closed	The section A.3 mentions the Project participant as "Mukand Limited - Public Limited Company" which does not indicate whether Mukand Limited is a "Public Entity" or "Private Entity". Clarification requested.	LRQA confirmed that Mukand Limited is a private entity. PP has revised the section A.4.3 of PDD so as to indicate the same.	Project Participants/PDD/A.4.3	13 Jan 09	CL 1	Guidelines for completing CDM-PDD Version 07
CL	Closed	The table under section B.3 indicates inclusion of CO_2 emissions resulting from 'Fossil fuel consumption in boiler for thermal energy' for calculation of baseline emissions, while the justification for the same mentions 'There is no fossil fuel consumption as the boiler does not exist in the baseline scenario'. Clarification requested.	LRQA confirmed there was no thermal energy requirement at the facility, hence there would not have been any fossil fuel consumption for thermal energy in baseline. PDD section B.3 was suitably revised and therefore this finding has been closed.	Project boundary/PDD/B.3	13 Jan 09	CL 2	Para. 37 (e) CDM M&P
CL	Closed	Please justify with supporting evidences the capital investment of INR 537 million considered for setting up a coal based power plant as stated in footer 9. Please demonstrate how the same is arrived considering realistic and credible comparison with the project activity. Also provide the assumptions / calculations to arrive at generation/operational cost of INR 1.53 per unit of electricity (as mentioned in footer 10 on page 18 of PDD).	It was demonstrated that due to non-availability of coal in the region, setting up a coal based power plant is not a potential alternative. LRQA confirmed the non-availability of coal in the region through background investigation involving web-search and document review of public information. Hence there is not need for evaluating the economic attractiveness of setting up a coal based power plant.	Details of baseline and its development/PDD/B.4	13 Jan 09	CL 3	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	Open	Followings to be clarified related to the IRR analysis: 1. The maximum availability of BF gas is considered as 60,000 Nm^3/hr, whereas the same is calculated as 63,408.33 Nm^3/hr considering the production of 700 tons/day and 2174 Nm3/thm. Moreover, the BF gas is partially consumed in the hot blast stoves and the remaining portion will be utilized for power generation. The same also have an effect on the f_{CAP} determination. During the site visit the PP mentioned that 22-23% of the BF gas generated from the MBF will be utilized in the hot stoves while remaining will be utilized in the boiler. Clarification is requested. 2. The PDD (p20) states the boiler efficiency as 86%. However the technical specifications of the boiler state the efficiency of 80.8% assuming 100% BF gas firing and 87.9% assuming 100% HFO firing. Clarification is requested as to how the efficiency of boiler has been considered given that the project design involves co-firing of HFO oil for supplementing the heat and also there is 100% of HFO firing in case the MBF is not operational due to maintenance/shutdown. 3. The "CER Cal" spreadsheet and the technical specifications of the MBF states that the annual MBF availability is for 350 days which contradicts with 320 days as mentioned in "FO consumption " spreadsheet. Also please clarify the 100% use of furnace oil for 30 days considering 350 operational days for boiler. 4. The plant bill for the month of May 2008 reflects a tariff rate of INR 3.8 and INR 4.3 per kwh electricity. Please justify the rate of INR 3.8/kwh as considered in the IRR calculations. Also PP is requested to provide the electricity bills for the year 2006, 2007, Jan-May 2008.	1. Certificate from Chartered Engineer dated 19/05/2009 confirms the average BF gas generation of 82,348 Nm^3/hour with approximately 23-24% of BF gas consumption in hot stoves. Hence, approximately 63,408 Nm^3/hour are available for use in the boiler for steam generation. 2. PP has considered the correct efficiency for 100% blast furnace gas firing as 86.1%. LRQA confirms the same by cross checking the purchase contract between Mukand Ltd and ISGEC John Thompson dated 17 May 2008 Annexure-VI and letter dated 30/04/2007 from the boiler manufacturer stated an efficiency of 86.1% for 100% BF gas firing. LRQA confirmed that the emission reduction and IRR spreadsheet consistently use the efficiency of 86.1% in case of 100% blast furnace gas firing. 3. The IRR sheet considers availability of MBF to be 345 days. LRQA could confirm the same from the Certificate from Chartered Engineer dated 19/05/2009. The PP clarified that furnace oil will be consumed in the project activity power plant only in emergency situations when there is insufficient availability or non-availability of Blast Furnace Gas (BFG). This may happen due to some operational problems in the Blast Furnace or due to shut down of the Blast Furnace 4. PP has considered a tariff rate of INR 3.91/kWh for the first year with as escalation of 2.49% every year. LRQA confirmed the tariff to be appropriate as it is the average tariff rate over a period of two years. The	Additionality/PDD/B.5	13 Jan 09	CL 4	Para. 43 CDM M&P

Grade 1	Status 2	Finding 3	Corrective action review 4	Process / aspect 5	Date 6	Reference 7	Clause 8
			escalation rate is determined form the wholesale price index published by the Office of economic advisor, Government of India. The period of 5 year (2002-03 to 2006-07) for determining the escalation is considered appropriate as the power sector underwent a major change due to the Electricity Act, 2003.				