VERIFICATION AND CERTIFICATION REPORT

"GENERATION OF ELECTRICITY THROUGH COMBUSTION OF WASTE GASES FROM BLAST FURNACE AND COREX UNITS AT JSW STEEL LIMITED (IN JPL UNIT 1), AT TORANGALLU IN KARNATAKA, INDIA"

CDM REFERENCE NO. 0325
MONITORING AND REPORTING PERIOD:
01 JANUARY 2007 TO 31 DECEMBER 2007

Report No. 2008-2025

REVISION NO. 01

DET NORSKE VERITAS

VERIFICATION AND CERTIFICATION REPORT

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Approved by: Michael Lehmann Technical Director	Organisational unit: Climate Change Services
Client: JSW Steel Limited	Client ref.: Mr. Suresh Iyer

DET NORSKE VERITAS
CERTIFICATION AS

Veritasveien 1,
1322 HØVIK, Norway
Tel: +47 67 57 99 00
Fax: +47 67 57 99 11
http://www.dnv.com
Org. No: NO 945 748 931 MVA

Summary:

Det Norske Veritas Certification AS (DNV) has been commissioned by JSW Steel Limited (JSWSL) to carry out verification of the emission reductions reported for the "Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India" project for the period 1 January 2007 to 31 December 2007.

In our opinion, the GHG emissions reductions reported for the project in the revised monitoring report version 01 dated 9th June 2008 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology (ACM0004 version 01), the monitoring plan and the formulae provided in the validated project design document of 27 December 2006. As a consequence, DNV is able to certify that the emission reductions from the project during the period 1 January 2007 to 31 December 2007 amount to 743 864 t CO_2 equivalent.

Report No.: 2008-2025	Subject Group: Environment
Report title: "Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India"	
Work carried out by: K Venkata Raman, Gaurav Srivastava, Michael Lehmann	
Work verified by: Chandrasekhara Kumaraswamy	
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Abbreviations

JSW	Jindal Steel Works
BF	Blast Furnace
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH_4	Methane
CO_2e	Carbon dioxide equivalent
DNA	Designated National Authority
DNV	Det Norske Veritas
DOE	Designated Operational Entity
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
EMS	Environmental Management System
HAZOP	Hazard and Operability Studies
DCS	Distributed Control System
NGO	Non-governmental Organisation
PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change

1 INTRODUCTION

Det Norske Veritas Certification AS (DNV) has been commissioned by JSW Steel Limited (JSWSL) to carry out verification of the emission reductions reported for the "Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India" project (hereafter the project) for the period 01 January 2007 to 31 December 2007. This report contains the findings from this verification assignment and a certification statement for the certified emission reductions.

1.1 Objective

Verification is the periodic independent review and *ex post* determination by the Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined verification period.

Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

1.2 Scope

The verification scope is:

- to verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan,
- to evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement,
- to verify that the reported GHG emission data is sufficiently supported by evidence, i.e. monitoring records.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified. The verification team has, based on the recommendations in the Validation and Verification Manual /5/, and employed a risk-based approach, focusing on the identification of significant reporting risks and verifying the mitigation measures for these.

1.3 GHG Project Description

Project Parties:	The Republic of India and the United Kingdom.
Title of project activity:	Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India
UNFCCC registration No:	0325
Methodology applied:	ACM0004, Version 01
Project Participants:	JSW Steel Limited (JSWSL) and Noble Europe Limited and EDF Trading Limited

Location of the project activity:	The project is located at the steel plant site of JSW Steel Limited in Toranagallu near Bellary town, Karnataka state in the Republic of India.
Project's crediting period	1 April 2005 to 31 March 2015 (Fixed crediting period)
Verification period	1 January 2007 to 31 December 2007
Project's actual starting date	The power project was completed and commissioned on 1 April 2005, which is considered to be the start of the crediting period.

The primary objective of the project activity is to utilize the waste gases from the blast furnace and COREX units of the steel plant for electricity generation for captive consumption. In the baseline scenario, the waste gases were being flared off, and the electricity requirement would have been met by power from a captive power plant using coal as the fuel as is the common practice or from any other independent power producer. The project activity consists of a bi-drum steam generator capable of generation of 390 tonnes per hour of steam at 93 kg/cm^2 at 540ºC and is capable of firing both blast furnace and COREX waste gases. The generated steam is used to drive a 100 MW generator for generation of electricity power for captive consumption. The will replaces/substitutes a major quantity of the electricity requirement of JSW Steel Limited.

The project was implemented and commissioned on 1 April 2005. Following CDM registration of the project, the project activity has already been issued CER's for the period 1 April 2005 to 31 December 2006.

The emission reductions from the project for the period from 1 January 2007 to 31 December 2007 as reported in the revised monitoring report of 9th June 2008 and actually verified at site equals to 743864 tonnes of CO_2 equivalent.

2 METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. As the CDM Executive Board has not yet formally endorsed the application of any materiality principle for verification of emission reductions from CDM projects - implying that emphasis should be on the significant contributors to emission reductions - the DNV team has for this assignment decided to check all factors and issues with the same emphasis. Despite this, the team has during its preparations identified the key reporting risks and used the assessment to determine to which extent the project operator's control systems were adequate for mitigation of these key reporting risks. In addition, other areas that can have an impact on reported emission reductions have also undergone detailed audit testing.

The verification process was guided by a verification checklist, which aims to ensure a transparent verification process. This documents in detail how emission reductions have been verified and how the verification findings have been reached.

Verification Team:

K Venkata Raman	DNV Bangalore	Team Leader & CDM Verifier
Gaurav Srivastava	DNV Bangalore	GHG Auditor (Applicant)
Michael Lehmann	DNV Oslo	Energy sector expert
C. Kumaraswamy	DNV Bangalore	Technical Reviewer

Duration of verification

Preparations:	17 & 18 March 2008.
On-site verification:	19 March 2008.
Reporting:	20 March 2008 – 27 March 2008

2.1 Review of Documentation

The monitoring report (version 00) and the subsequent revision 01 /1/ and the emission reduction calculations, provided in the form of spreadsheet submitted by JSW Steel Limited, were assessed as a part of the verification. In addition the Project Design Document /2/, in particular the baseline estimations and the monitoring plan contained in the PDD, were also assessed as well as the validation report /3/. Moreover, other documents referenced as [/4/ -/10/] were also assessed as evidence.

2.2 Site Visit

Detailed verification of all data contained in the monitoring report was performed during a site visit at JSW Steel Limited on 19 March 2008. During the site visit, the following personnel were interviewed or assisted the verification team:

JSW Steel Limited
Mr. Suresh Iyer – DGM
Mr. Aditya Agarwal - AGM CPP-1
Mr. Suryaprakash - AGM CPP-2
Mr. A. Subramaniam - Senior Manager JSWEL
Mr. Prasanna Kumar - Dy. Manager Operations
Mr. Ramakrishnan - Dy. Manager
Mr. Jagdish - Asst Manager
Mr. B. Hadava Rao - Asst Manager
Mr. Suraj P. Kuriakose - Asst Manager CPP
Mr. D. Humantha Rao- Jr. Manager Operations
Mr. Chintan Mehta, Consultant, Cantor CO2e

Agenda

- Detailed checking of the monitoring records and spreadsheets, as per monitoring plan and report.
- Assessment of calibration records.

2.3 Reporting of Findings

Findings established during the verification may be that:

i) The verification is not able to obtain sufficient evidence for the reported emission reductions or part of the reported emission reductions. In this case these emission reductions shall not be verified and certified;

ii) The verification has identified material misstatements in the reported emission reductions. Emission reductions with material misstatements shall be discounted based on the verifier's ex-post determination of the achieved emission reductions.

A forward action request (FAR) may be issued, where:

- the actual project monitoring and reporting practices requires attention and /or adjustment for the next consecutive verification period, or
- an adjustment of the Monitoring Plan is recommended.

In the context of FARs, risks may be identified, which may endanger the delivery of CERs in the future, i.e. by deviations from good reporting or management procedures. As a consequence, such aspects should receive a special focus during the next verification.

3 VERIFICATION FINDINGS

3.1 Remaining Issues, CARs / FARs from Previous Validation or Verification

According to the validation report /3/, no CAR or CL's were required to be closed out during verification.

Similarly, no CAR's / FAR's were required to be closed out by the verifying body following the first verification.

3.2 Project Implementation

The project has been implemented as planned. The project boundaries and key equipments for the project activity are in line with the PDD. The project boundary covers the following:

- The waste gas sources, the blast furnaces and the COREX units.
- The power plant comprising of the natural circulation boiler and the generating set.
- All the other equipments and facilities necessary for the transportation of the waste gases and export of electricity also form a part of the project boundary.

The starting date of the project activity (commercial operation) is 1 April 2005 and has been verified by DNV. Valid air and water consents have also been obtained from the Karnataka State Pollution Control Board (KSPCB). In addition the verification of air and effluent reports confirm that relevant pollution parameters as specified in the consents are within the specified limits.

3.3 Project Baseline

The approved baseline methodology ACM0004, version 01–"Consolidated baseline methodology for waste gas and/or heat for power generation" has been applied for the project activity. In accordance with ACM0004, the baseline scenario for the project activity has been determined and validated as:

i) The emission factor for the captive generation, estimated ex-ante to be 1.03 tCO_2/MWh (as per option 1 of the methodology for captive power generation (either existing or new). However the emission factor is seen to be based on an efficiency of 33% (as assumed in page 13 of the registered PDD) instead of the efficiency of 33.375% as stated in the table in page 12 of the registered PDD. The emission factor considering an efficiency of 33.375% works out to 1.02 t

CO_2/MWh and had been used in the calculations in line with the EB's query in request for review.

ii) The plant efficiency for the calculation of the emission factor has been estimated by option A of the methodology (considering manufacturer's nameplate data for efficiency of the existing boilers) and considered at 33.375%, defined ex-ante. This has been validated

3.4 Completeness of Monitoring

As required by the monitoring methodology ACM0004 and the monitoring plan of the registered PDD, the following parameters are being monitored.

- Total electricity generated (EGgen) - measured
- Total auxiliary energy consumed by the project (EGaux) – measured
- Net electricity supplied to the facility (EGy) – calculated as the difference of above.
- Volume of light diesel oil (LDO) consumed (Q1) – measured
- Volume of high speed diesel oil (HSD) consumed (Q2) – measured
- Net calorific value of LDO and HSD – GCV is analyzed in the in-house laboratory and NCV calculated as per ASTM procedure D 4809-00
- Carbon emission factor for LDO and HSD – IPCC default values applied
- Emission factor for coal – IPCC default values applied
- Plant efficiency – Calculated.
- Emission factor for captive power generation – Calculated

Necessary management system procedures including responsibility and authority for monitoring activities have been verified to be as per established and documented quality management system procedures. Knowledge of personnel associated with the project activity was also found to be satisfactory.

3.5 Accuracy of emission reduction calculations

No significant reporting risks have been identified for the data reported. The parameters reported, including source, frequency and review criteria as indicated in the monitoring plan were verified to be correct and in line with the validated monitoring plan of the PDD. The same has been archived in the project monitoring excel worksheet (JPL1 ER CALCUATIONS). The aforementioned worksheet contains all the data and calculations for the period 01 January 2007 to 31 December 2007.

The baseline emissions have been calculated as the product of the net electricity supplied to the manufacturing facility and the emission factor for captive power generation at 1.02 t CO_2/MWh (conservative as per the explanation provided in section 3.3).

The net electricity supplied to the manufacturing facility is calculated as the difference of the total electricity generated and the auxiliary consumption. The total electricity generated and the auxiliary consumptions are measured / determined as follows:

Total electricity generated (EGgen), as MWh/yr - is summation of electricity meter readings at '0:00' hours from generator transformers GT-1 and GT-2, and maintained in the "0" hour log book and transposed in to the computer database. Joint meter readings are taken along with JSW Steel every month. The meters used are of 0.2 class accuracy and have been calibrated every year as per the company's procedures. These records have been verified and found to be correct.

While the installed capacity is 100 MW, it has been confirmed from the technical specifications provided by the equipment manufacturer Siemens, that the maximum total generator output is 104.4 MW. The monthly total electricity generation for all the months (except in October 2007) in the monitoring period are within the installed capacity. The plant load factor achieved in the month of October 2007 was 100.63% and is within the maximum generator output of 104.4 MW and hence acceptable. Hence, DNV confirms that the generation has not exceeded the maximum output capacity (as stated by the manufacturer).

Total auxiliary energy consumed by the project (EGaux), as MWh/yr - is a summation of electricity meter readings of station auxiliary transformer (SAT) and 6.6 kV incomer I panel from the steel plant (BF) at '0:00' hours. Joint meter readings are taken with JSW Steel every month. The daily readings are logged in the "0" hour log book and the data is transposed in to the excel worksheet. The meters are calibrated every year as per the company's procedures. The records of the "0" hour log book and the calibration certificates have been verified.

Net electricity supplied to facility (EGY), MWh/yr – is determined as the difference between $EG_{GEN} - EG_{AUX}$, from the daily and monthly records.

Efficiency of the Captive Power Plant: Though not required by the monitoring plan of the registered PDD, the emission factor for the captive generation is calculated at 1.042 t CO_2/MWh. This is higher than the ex ante fixed value of 1.03 t CO_2/MWh mentioned in the registered PDD (calculated using the manufacturer's nameplate data for efficiency of the existing boilers). Hence the use of the lower and ex-ante fixed emission factor of 1.03 t CO_2/MWh for the emission reduction calculations is conservative. The efficiency of the project plant has been calculated on the basis of the heat rate of the plant (calculated on the basis of the total energy supplied to the captive power plant (calculated as a product of total waste blast furnace gas, corex gas and LDO (all measured) consumed in the plant, NCV of the respective fuels (averaged monthly) and gross generation of the captive power plant (measured)). All the data used in the calculation of the efficiency are being monitored and have been verified from the "0" hour log book and the lab analysis reports. The calculations have also been verified to be correct.

Emission Factor of the captive power plant- The efficiency of the project as per the registered PDD is 33.375% (manufacturer's nameplate data for efficiency of the existing boilers). The project activity efficiency calculated (verified by DNV and explained in section 3.5) is 32.38%. Since the actual calculated efficiency of the project activity cannot exceed or equal the nameplate efficiency (design), consideration of the project activity efficiency of 33.375% for the emission factor is deemed conservative.

The **project emissions** are calculated as the product of the HSD/LDO consumption (measured), the net calorific value (estimated in lab), carbon emission factor (default IPCC value) and the oxidation factors (default IPCC value). The fuel consumed (HSD/LDO) is monitored daily at '0:00' hours and recorded in the log-book and computer data base. These records have been verified.

The emission reductions are the difference of the baseline emission and the project emissions.The calculations have been verified to be in line with the validated PDD. The emission reductions from the project for the period from 1 January 2007 to 31 December 2007 as reported in the monitoring report of version 01 dated 9th June 2008 and actually verified at site equals to 743 864 tonnes of CO_2 equivalent. The reported emission reductions of 743 864 are lower (by 3.05%) than the estimated emission reduction of 767 325 (estimated for the same period as per the registered PDD of 27 December 2006).

Year	Registered PDD ERs	Monitoring Report ERs
01 January 2007- 31 December 2007	767 325	743 864
% Deviation from PDD	0	-3.05%

The project activity utilizes various process control systems and its components like distributed control system (DCS) for automatically controlling the manufacturing process. This includes smart transmitters that are calibrated as per planned schedules, for monitoring the process parameters like temperature, flow, pressure etc and feeding this information to the DCS. The electrical generation readings are read directly from the 0.2 class energy meters and logged in the zero hour log book and also maintained as a soft copy. Class 0.2 meters are used for the auxiliary power consumption. The net electricity supplied to the facility is calculated as the difference of the above. The quantity of LDO and HSD fuels consumption is measured based on the difference in tank levels and the receipt details. The gross calorific values (GCV) of the fuels is measured in a bomb calorimeter and then converted to net calorific value (NCV) using the standard formulae as per ASTM standard. The verification team has assessed all continuous and daily data and the aggregated numbers are found to be correct.

3.6 Quality of Evidence to Determine Emission Reductions

The data presented in the revised monitoring report of 9th June 2008 was assessed by reviewing in detail project documentation, interviews with personnel at JSW Steel Limited, collection of monitored data, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of the reported monitoring results and verify the correct application of the approved monitoring methodology. All necessary documentation is collected, referenced and aggregated and is easily accessible in electronic format. Measurement is performed by calibrated equipment.

3.7 Management System and Quality Assurance

JSW Steel Limited has developed GHG emission reduction management system for management of the project. The procedures cover the calibration and quality assurance of the monitoring and

metering systems for the project activities. Calibration is carried out yearly and the calibration certificates were also verified during the site visit.

4 CERTIFICATION STATEMENT

Introduction

Det Norske Veritas Certification AS (DNV) has performed a verification of the emission reductions reported for the "Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India" (CDM Registration Reference No. 0325) for the period 1 January 2007 to 31 December 2007.

The project has applied the approved baseline and monitoring methodology ACM0004; version 01, and emissions and emissions reductions are reported in the revised monitoring report dated 9th June 2008. We express no opinion on the baseline methodology neither on the project nor on the validated and registered PDD.

Responsibilities of JSW Steel Limited and Det Norske Veritas Certification AS

The management of JSW Steel Limited, at Bellary, Karnataka, is responsible for the preparation of the GHG emissions reduction data on the basis set out within the revised monitoring report (dated 9th June 2008). The development and maintenance of records and reporting procedures are in accordance with the approved monitoring methodology ACM0004, version 01, including the calculation and determination of GHG emission reductions from the project.

It is DNV's responsibility to express an independent verification statement on the GHG emission reductions reported from the project for the period from 01 January 2007 to 31 December 2007 based on the verified emissions for the same period and the project's compliance with the approved baseline and monitoring methodology ACM0004, version 01.

Basis of GHG verification opinion

Our verification approach was based on the requirements as defined under the Kyoto Protocol, the CDM modalities and procedures, as well as those defined by the CDM Executive Board and by the baseline and monitoring methodology ACM0004, version 01and the registered PDD of the project.

Our verification approach draws on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these. Our examination includes assessment of evidence relevant to the amounts and disclosures in relation to the project's GHG emission reductions reported for the period from 01 January 2007 to 31 December 2007.

We planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that the reported amount of GHG emission reductions for the period from 01 January 2007 to 31 December 2007 is fairly stated.

We conducted our verification on the basis of the monitoring methodology ACM0004, version 01, and the monitoring plan included in the validated and registered PDD of the project. The verification included:

- *Collection of evidence supporting the reported data.*

- *checking whether the provisions of the monitoring methodology ACM0004, version 01, and the monitoring plan in the registered PDD were consistently and appropriately applied.*

We have verified whether the information included in the revised monitoring report for the project (dated 9th June 2008) is correct and that the emissions reductions achieved have been determined correctly.

Certification Statement

In our opinion, the GHG emission reductions stated in the revised monitoring report of 9th June 2008 for the "Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India" for the period from 01 January 2007 to 31 December 2007 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology (ACM0004, version 01) and the monitoring plan contained in the registered PDD of 27 December 2006). Det Norske Veritas Certification AS is able to certify that the reported emission reductions from the project during the period 01 January 2007 to 31 December 2007 amount to 743 864 tonnes of CO_2 equivalent.

Bangalore and Oslo, 12 June 2008

Michael Lehmann

Manager (South Asia)	*Technical Director*
Climate Change Services	Climate Change Services
Det Norske Veritas Certification AS	Det Norske Veritas Certification AS

5 REFERENCES

Documents provided by the project participants that relate directly to the project:

/1/ Monitoring Report: *"Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India"* dated 22 February 2008 and the revised monitoring report of version 01 dated 9th June 2008.

/2/ CDM Project Design Document: *"Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India"* version 04 dated 27 December 2006.

/3/ Validation Report – *"Generation of Electricity through combustion of waste gases from Blast furnace and Corex units at JSW Steel Limited (in JPL unit 1) at Torangallu in Karnataka, India"*

Background documents related to the design and/or methodologies employed in the design or other reference documents:

/4/ Approved baseline and monitoring methodologyACM-0004, version01: "Consolidated baseline methodology for waste gas and/or heat for power generation"

/5/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. http://www.vvmanual.info.

/6/ Project monitoring excel sheet, JPL1 ER CALCUATIONS .xls, and revised worksheet JPL1-ER CAL_UPTO 2001-09-06-08.xls

/7/ Calibration certificates of the flow meters, Energy meters and Bomb calorimeters as indicated in the monitoring plan.

/8/ Log book for gross, auxiliary and net electricity generation.

/9/ Monthly lab analysis report for NCV of LDO and HSD.

/10/ Accreditation certificate from National Accreditation Board for Testing and Calibration Laboratories (NABL) for process and quality assurance.

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APPENDIX-A

VERIFICATION CHECKLIST

Table 1: Data Management System/Controls

The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks.

The GHG data management system/controls are assessed against the expectations detailed in the table. A score is assigned as follows:

- Full - all best-practice expectations are implemented.
- Partial - a proportion of the best practice expectations is implemented
- Limited - this should be given if little or none of the system component is in place.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
A. Defined organisational structure, responsibilities and competencies		
A.1. Position and roles *Position and role of each person in the GHG data management process is clearly defined and implemented, from raw data generation to submission of the final data. Accountability of senior management must also be demonstrated.*	Full	It was defined in the management system documentation and well understood by the personnel.
A.2. Responsibilities *Specific monitoring and reporting tasks and responsibilities are included in job descriptions or special instructions for employees.*	Full	Specific monitoring and reporting tasks are described in the relevant documented procedures.
A.3. *Competencies needed* *Competencies needed for each aspect of the GHG determination process are analysed. Personnel competencies are assessed and training programme implemented as required.*	Full	Competencies of the personnel in charge of monitoring and calculation process are deemed sufficient. Competency requirements are linked as part of ISO 9001 procedures.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
B. Conformance with monitoring plan		
B.1. Reporting procedures *Reporting procedures should reflect the monitoring plan content. Where deviations from the monitoring plan occur, the impact of this on the data is estimated and the reasons justified.*	Full	No deviation from the monitoring plan has been found.
B.2. Necessary Changes *Necessary changes to the monitoring plan are identified and changes are integrated in local procedures as necessary.*	Full	No changes were identified to the monitoring plan.
C. Application of GHG determination methods		
C.1. Methods used *There are documented description of the methods used to determine GHG emissions and justification for the chosen methods. If applicable, procedures for capturing emissions from non-routine or exceptional events are in place and implemented.*	Full	Integral part of the methods used to determine GHG emissions are documented properly. Net electricity supplied was properly monitored and calculated in line with the procedure.
C.2. Information/process flow *An information/process flow diagram, describing the entire process from raw data to reported totals is developed.*	Full	An information/process flow are defined and understood by the concerned personnel.
C.3. Data transfer *Where data is transferred between or within systems/spreadsheets, the method of transfer (automatic/manual) is highlighted - automatic links/updates are implemented where possible. All assumptions and the references to original data sources are documented.*	Full	No mistake of data manual transfer has occurred.
C.4. Data trails *Requirements for documented data trails are defined and implemented and all documentation are physically available.*	Full	All necessary raw/intermediate data is maintained properly. Non-routine event has been recorded and maintained properly.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
D. Identification and maintenance of key process parameters		
D.1. Identification of key parameters *The key physical process parameters that are critical for the determination of GHG emissions (e.g. meters, sampling methods) are identified.*	Full	The key physical parameters are identified.
D.2. Calibration/maintenance *Appropriate calibration/maintenance requirements are determined.*	Full	Necessary calibration and/or maintenance for the measurement equipment have been conducted according to the documented procedures.
E. GHG Calculations		
E.1. Use of estimates and default data *Where estimates or default data are used, these are validated and periodically evaluated to ensure their ongoing appropriateness and accuracy, particularly following changes to circumstances, equipment etc. The validation and periodic evaluation of this is documented.*	Full	IPCC default values as given for CO2 emission factor, oxidation factor and calorific value of, HSD and LDO consumed has been used.
E.2. Guidance on checks and reviews *Guidance is provided on when, where and how checks and reviews are to be carried out, and what evidence needs to be documented. This includes spot checks by a second person not performing the calculations over manual data transfers, changes in assumptions and the overall reliability of the calculation processes.*	Full	No calculation and reporting error has been encountered thus checking and reviewing system deem effective.
E.3. Internal verification *Internal verifications include the GHG data management systems, to ensure consistent application of calculation methods.*	Full	The data necessary for calculating GHG emissions and the calculation results have been archived properly. It is fully understood among the relevant personnel.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
E.4. Internal validation *Data reported from internal departments should be validated visibly (by signature or electronically) by an employee who is able to assess the accuracy and completeness of the data. Supporting information on the data limitations, problems should also be included in the data trail.*	Full	Data used for calculation don't include any mistake and the validation is deemed sufficient.
E.5. Data protection measures *Data protection measures for databases/spreadsheets should be in place (access restrictions and editor rights).*	Full	Data protection and back-up procedures are defined and maintained properly.
E.6. IT systems *IT systems used for GHG monitoring and reporting should be tested and documented.*	---	NA

Table 2: Detailed audit testing of risk areas and random testing

Areas of residual risks	**Additional verification testing performed**	**Conclusions and Areas Requiring Improvement (including *Forward Action Requests*)**
List the residual areas of risks (Table 2 where detailed audit testing is necessary. *In addition, other material areas may be selected for detailed audit testing.*	*The additional verification testing performed is described. Testing may include:* ➢ *Sample cross checking of manual transfers of data* ➢ *Recalculation* ➢ *Spreadsheet 'walk through' to check links and equations* ➢ *Inspection of calibration and maintenance records for key equipment* ➢ *Check sampling analysis results* ➢ *Discussions with process engineers who have detailed knowledge of process uncertainty/error bands.*	*Having investigated the residual risks, the conclusions should be noted here. Errors and uncertainties should be highlighted.* *Errors and uncertainty can be due to a number of reasons:* ➢ *Calculation errors. These may be due to inaccurate manual transposition, use of inappropriate emission factors or assumptions etc.* ➢ *Lack of clarity in the monitoring plan. This could lead to inconsistent approaches to calculations or scope of reported data.* ➢ *Technological limitations. There may be inherent uncertainties (error bands) associated with the methods used to measure emissions e.g. use of particular equipment such as meters.* ➢ *Lack of source data. Data for some sources may not be cost effective or practical to collect. This may result in the use of default data which has been derived based on certain assumptions/conditions and which will therefore have varying applicability in different situations.*
- ID No. 1_1 (Q_1) ➢ Measured based on the difference in tank levels and the receipt details	- ID No. 1_1 (Q_1) ➢ Monitored daily at '0:00' hours and recorded in the log-book and computer database. These records have been verified and are OK.	No errors, uncertainties or areas of improvement were identified.
- ID NO. 2_1 (NCV_1)		No errors, uncertainties or areas of improvement were identified.

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including *Forward Action Requests*)
➢ The gross calorific values (GCV) of the fuels is measured in a bomb calorimeter and then converted to net calorific value (NCV) using the standard formulae as per ASTM	➢ Estimated on monthly basis. ➢ Certificate of calibration verified OK.	
- ID No. 1_2 (Q_2) ➢ Measured based on the difference in tank levels and the receipt details	- ID No. 1_2 (Q_2) ➢ Monitored daily at '0:00' hours and recorded in the log-book and computer database. These records have been verified and are OK.	No errors, uncertainties or areas of improvement were identified.
- ID NO. 2_2 (NCV_2 ➢ The gross calorific values (GCV) of the fuels is measured in a bomb calorimeter and then converted to net calorific value (NCV) using the standard formulae as per ASTM standard.	- ID NO. 2_2 (NCV_2) ➢ Estimated on monthly basis. ➢ Certificate of calibration verified OK.	No errors, uncertainties or areas of improvement were identified.

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including *Forward Action Requests*)
- ID No. 4 (EG_{GEN}) ➢ Electricity meter for GT1 And GT2	- ID No. 4 (EG_{GEN}) ➢ EGgen - is summation of electricity meter readings at '0:00' hours from generator transformers GT-1 and GT-2, and maintained in the "0" hour log book and transposed in to the computer database. ➢ Certificate of calibration verified OK.	No errors, uncertainties or areas of improvement were identified.
- ID No. 5 (EG_{SAT}) ➢ Total auxiliary Energy consumed by the project, supplied through station aux. transformer & 6.6 Incomer-1	- ID No. 5 (EG_{SAT}) ➢ EG_{SAT}- is a summation of electricity meter readings of station auxiliary transformer (SAT) and 6.6 kV incomer I panel from the steel plant (BF) at '0:00' hours. Joint meter readings are taken with JSW Steel every month. The daily readings are logged in the "0" hour log book and the data is transposed in to the excel worksheet. ➢ Certificate of calibration verified OK.	No errors, uncertainties or areas of improvement were identified.
- ID No. 6 (EG_Y) ➢ Net electricity supplied to the industrial facility (Calculated).	- ID No. 6 (EG_Y) ➢ EG_Y – is determined as the difference between $EG_{GEN} – EG_{AUX}$, from the daily and monthly records.	No errors, uncertainties or areas of improvement were identified.
- ID NO. 14 (Eff_{Cap}) ➢ Calculated on the	- ID NO. 14 (Eff_{Cap}) ➢ Recalculation was made to confirm the	No errors, uncertainties or areas of improvement were identified.

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including *Forward Action Requests*)
basis of heat rate and gross generation of the CPP.	correctness OK.	

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