VERIFICATION / CERTIFICATION REPORT

INDIA CEMENTS WHR PROJECT IN INDIA

(CDM REGISTRATION REFERENCE NO. 0717)
FIRST PERIODIC VERIFICATION

Monitoring Period
6 JANUARY 2007 TO 31 DECEMBER 2007

REPORT NO. 2008-0371
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DET NORSKE VERITAS

VERIFICATION / CERTIFICATION REPORT

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Client: The India Cements Limited	Client ref.: Mr. Duraisamy Sivagurunathan

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Summary:

Det Norske Veritas Certification AS (DNV) has performed a verification of the emission reductions reported for the 'India Cements WHR Project' in India, a waste heat recovery and utilization for power generation project at a cement plant in Vishnupuram, Nalgonda district of Andhra Pradesh, managed by The India Cements Limited of India and Agrinergy Limited of The United Kingdom for the period of 6 January 2007 to 31 December 2007.

In our opinion the GHG emissions reductions reported for the project in the monitoring report, version 2 of 17 March 2008 are fairly stated.

The GHG emission reductions have been calculated correctly on the basis of the baseline and monitoring methodology AM0024, version 1, and the monitoring plan of the registered PDD of 25 September 2006

Det Norske Veritas Certification AS is able to certify that the emission reductions from the 'India Cements WHR Project' during the period 6 January 2007 to 31 December 2007 amount to 47 550 tCO_2 equivalent.

Report No.: 2008-0371	Subject Group: Environment
Report title: India Cements WHR Project in India	
Work carried out by: Soumik Biswas, Astakala Vidyacharan, Sasim Chattopadhyay, Indrajit Rana, Michael Lehmann	
Work verified by: Chandrashekara Kumaraswamy	

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Indexing terms

Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism	Service Area Verification Market Sector Cement Industry

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Abbreviations

APCPDCL	Andhra Pradesh Central Power Distribution Company Limited
BM	Build margin
CER	Certified Emission Reduction(s)
ERU	Emission Reduction Units(s)
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CEF	Carbon Emission Factor
CM	Combined margin
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
DNA	Designated National Authority
DNV	Det Norske Veritas
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
ICL	The India Cements Limited
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
NCCBM	National council for cement and building materials
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating margin
PDD	Project Design Document
PLR	Prime Lending Rate
SREG	Southern Regional Electricity Grid
TPD	Tonnes per day
UNFCCC	United Nations Framework Convention for Climate Change
VER	Voluntary Emission reductions
WHR	Waste Heat Recovery

1 INTRODUCTION

The India Cements Limited has commissioned Det Norske Veritas Certification AS (DNV) to carry out verification and certification of the GHG emission reductions reported for the "India Cements WHR Project" in India for the period of 6 January 2007 to 31 December 2007. This report summarizes the findings of the verification of the emission reductions of the project.

The verification team consisted of the following personnel:

Soumik Biswas	DNV India	CDM verifier, team leader
Astakala Vidyacharan	DNV India	GHG auditor
Sasim Chattopadhyay	DNV India	GHG auditor
Indrajit Rana	DNV India	GHG auditor (Applicant)
Michael Lehmann	DNV Norway	Sector expert
Chandrashekara Kumaraswamy	DNV India	Technical reviewer

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 the 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 for the project activity,
- 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.

The grid emission factor for the SREG has been sourced from published data by the Central Electricity Authority of India and used directly in the project activity. The Central Electricity Authority, Ministry of Power, Government of India has published a database of carbon dioxide emission factors from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This CO_2 baseline database, provides information about the OM and BM factors of all the regional electricity grids in India. DNV confirms that the database is an official publication of the Government of India for the purpose of CDM baselines and the OM in the CEA database is calculated using the simple OM approach based on the generation-weighted average emissions per electricity unit of all fossil-fuelled generating sources serving the system. The BM is calculated based on 20% most recent capacity additions.
The verification shall ensure that the reported emission reductions are complete and accurate in order to be certified. The project implementation and the monitoring plan is reviewed against the registered PDD, the final validation report and the procedures as agreed in the Marrakech Accords

and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AM0024, version 1. The validation team has, based on the recommendations in the Validation and Verification Manual employed a risk-based approach, focusing on the identification of significant risks or drawbacks in the project implementation and the verification of the generated emission reductions.

1.3 GHG Project Description

Project Party	: *India*
Title of the project activity	: *India Cements WHR Project*
Project Reference number	: *UNFCCC 00000717*
Project participants	: *The India Cements Limited and Agrinergy Limited*
Location of the project activity	: *The project is located in the cement manufacturing unit of India Cements Limited at Vishnupuram, Nalgonda, Andhra Pradesh, India*
Methodology	: *AM0024 version 1*
Project's crediting period	: *6 January 2007 to 5 January 2017 (fixed)*
Verification period	: *6 January 2007 to 31 December 2007*

1.4 Project technology

The project activity involves the installation of waste heat recovery based power generation system to generate electricity at The India Cements Ltd., Vishnupuram cement plant. The plant is located in the state of Andhra Pradesh, India.

The project generates electricity from the waste gases from the clinker manufacturing process. The Vishnupuram cement plant is equipped with two kilns of capacity 1,750 TPD and 4,500 TPD. The waste heat recovery system has been installed for the larger kiln. Waste gases are collected from a four stage suspension pre-heater with exhaust gases having a temperature of 350 ^{o}C and also from the cooler exhaust gas of the cement kiln having a temperature of 360 ^{o}C. These gases are passed through waste heat recovery boilers to generate steam which is fed to a 7.7 MW condensing type steam turbine generator for generation of electricity. The electricity thus generated is utilized for in-house consumption and thereby partially catering to the electricity requirement of the plant.

The project has been validated and registered as a CDM project on 6 January 2007.

In the absence of the project the electricity generated by the WHRB operation would have been sourced from the southern regional electricity grid. The project proponent has selected a fixed crediting period of 10 years with the starting date of the crediting period as 6 January 2007. During this verification, the project has accounted for emission reductions due to the waste heat based power generation and displacement of grid electricity for the period of 6 January 2007 to 31 December 2007.

The emission reductions due to the project are determined by multiplying the net amount of electricity generated from the waste heat based power plant by the emission coefficient of the southern regional electricity grid, which has been taken from the CO_2 database for emission factors developed and published by the Central Electricity Authority (CEA[1]) of India. The emission factor of the grid has been up-dated annually from the CEA database as per guidance of the methodology AM0024, version 1.

[1] CO_2 Baseline Database, http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

As per the provision of the methodology, project emissions have been calculated as the difference in fossil fuel combustion in the clinker making process of the cement plant before and after the implementation of the project.
No leakage effects could be associated with the project activity. This is in conformance with the methodology.

2 METHODOLOGY

Duration of verification:

Preparations : *27 February to 28 February 2008*

On-site verification : *3 March to 4 March 2008*

Reporting : *11 March to 25 March 2008*

2.1 Review of Documentation

The basis for the verification has been the initial monitoring report dated 22 January 2008 and a revised monitoring report dated 17 March 2008, the registered version of the project design document (PDD) dated 25 September 2006 and the approved baseline and monitoring methodology AM0024, version 1. The project operator has in addition supplied the verification team with emission reduction calculations provided in the form of spreadsheets and relevant back-up documents along with plant data sheets. The monitoring reports regarding monthly electricity generation & auxiliary consumption, consumption of coal in clinker making process, clinker production and energy consumption in cement mills have been assessed as a part of the verification. In addition, the baseline specific coal consumption in the clinker making process and the monitoring plan contained in the PDD has also been assessed.

2.2 Site Visits

As a part of the verification, DNV had carried out a site visit of the India Cements WHR Project in the Nalgonda district of Andhra Pradesh during the period 3 March 2008 to 4 March 2008. During this visit, DNV had verified the actual implementation of the project as described in the PDD. The commissioning certificates and the unique identification of the installed components have also been checked and found to be correct. During the site visit, the following personnel were interviewed or assisted the verification team:

Name	Organisation	Position
Mr. M. S. Raju,	The India Cements Limited	Senior General Manager (Production)
Mr. B. V. R. Babu,	The India Cements Limited	Assistant General Manager (Instrumentation)
Mr. V. V. Soma Raju,	The India Cements Limited	Senior Manager (Electrical)
Mr Raju	The India Cements Limited	Assistant General Manager (Production - CPP)
Mr. Santosh Kumar Singh	Agrinergy Limited	Consultant

3 VERIFICATION FINDINGS

3.1 Remaining issues, CARs, FARs from previous validation

There were no pending issues during the validation of the project design document. All the issues raised during the validation had been closed in the final validation report. The project activity has been registered as a CDM project on 6 January 2007.

An assessment of the CARs/FARs raised after the on-site verification carried out on 3 and 4 March 2008 is described in the following table:

CAR/FAR # at Initial verification	Description of the CAR/FAR	Comments	Conclusions
CAR 1	It has been observed that the clinker production was calculated by dividing raw meal input by 1.625. However as obtained from NCCBM documents as well as also verified from the annual clinker consumption for cement production and raw meal consumption of the plant as submitted to the department of central excise, Government of India, the raw meal to clinker conversion factor was found to be 1.46 t raw meal per ton of clinker. The project proponent is requested to correct the clinker production data reported in the monitoring report.	The conversion factor has been taken as 1.625 after considering recirculation dust at 12% of kiln feed which returns from the pre-heater (please refer point # 20 of NCCBM). Raw meal to clinker conversion factor after considering 12% recirculation dust from pre-heater comes to be – 1.45 * (1+12%) = 1.625 Therefore the conversion factor taken is the actual figure.	OK It has been confirmed from the NCCBM report that for monitoring the clinker production from the raw meal on daily basis after taking into account the 12% dust re-circulation is to be calculated based on a factor of 1.625 only. The clinker production reported in the monitoring report is thus correct.
CAR 2	$OXID_{fuel,\ y}$ is taken from IPCC 1996 value. The project proponent is requested to use the IPCC 2006 value.	$OXID_{fuel,\ y}$ is taken from IPCC 1996 as in the monitoring plan it was stated “to be fixed at the start of the project”. As advised by the DOE, this has now been changed to reflect the latest data available from IPCC, 2006	OK (formally concluded)
FAR 1	No formal internal audit was conducted by the ICL management for review of the project performance. ICL is requested to strengthen their internal audit procedures prior to the next verification.	ICL management has considered this point strongly and regular internal audits will be conducted to satisfy the requirements of the monitoring plan in general and to take timely corrective actions in particular to make sure that data is recorded in a transparent and correct manner	OK (formally concluded) Though internal audit procedures were not found to be adequate during this verification period, the data presented for the period have been found to be correct.

3.2 Project Implementation

Installation of the project was completed on 9 July 2004. The project was commissioned on 24 August 2004. The plant commenced operation on 17 September 2004 but was shutdown immediately due to a major breakdown. The project commenced operation again on 6 November 2004. This has been verified from certificates of installation and commissioning.

During the verification the calibration records of the electricity meters have been checked and found to be in order.

3.3 Methodology

The project has been registered with the approved methodology AM0024, "Baseline methodology for greenhouse gas reductions through waste heat recovery and utilisation for power generation at cement plants", version 1 dated 30 September 2005.

3.4 Baseline

As per the registered PDD available in the UNFCCC website the baseline for the project activity has been selected as electricity consumption from the southern regional electricity grid. The baseline emission factor of the relevant grid for the project has been calculated by the Central Electricity Authority of India according to the approved consolidated methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources". The combined margin emission factor has been updated annually from the CEA database which is publicly available.

3.5 Assessment of data

The data presented in the revised monitoring report were assessed by reviewing in detail the presented project documentation, production records, by interviews with personnel at The India Cements Limited, collection of measurement data, observation of established monitoring and reporting practices and an assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of reported monitoring results and verify the correct application of the approved monitoring methodology.

3.5.1 Factors used for project emission reduction calculations

'$EG_{CF,y}$' Quantity of electricity supplied to cement plant

The quantity of electricity supplied to the cement plant has been monitored from the gross generation and auxiliary consumption of the waste heat recovery power plant. The gross generation, auxiliary consumption and net electricity supplied to the plant has been metered and recorded in the 'Shift Log Book for WHR Power generation system'. As specified in the final PDD, the generation and auxiliary consumption has been recorded continuously through cumulative energy meters and daily net electricity generation values have been recorded. The monthly generation values have been consolidated from the daily data. The accuracy level of the meter as assessed by external calibrating agency was found to be within the acceptable limits.

'$NCV_{fuel,y}$' Net calorific value of coal used in the cement plant

The calorific value of coal has been measured in-plant by a standardized bomb calorimeter and recorded daily in the 'Monthly fine coal weight average report' from ICL laboratory. The monthly

average calorific value of coal has been calculated from the daily data. The bomb calorimeter was found to be calibrated to national standards.

'$F_{P,y}$' Annual energy consumption for clinker manufacturing in kiln II

The annual energy consumption for clinker production in kiln II has been calculated from the monitored coal consumption and net calorific value of coal. The coal consumption has been monitored continuously through weigh feeders installed in the plant and the net calorific value of coal has been measured in plant by standardized bomb calorimeter and recorded daily in the 'Monthly fine coal weight average report' from ICL laboratory.

'$O_{clinker,y}$' Clinker production from Kiln II after project implementation

The clinker production has been monitored from the raw meal consumption in kiln II and a NCCBM approved conversion factor of 1.625 t clinker per ton of raw meal. The clinker production figures has also been cross-checked with the annual clinker production data as submitted to the department of central excise, Government of India.

3.6 Accuracy of emission reduction calculations

The emission reduction calculations have been based on actual monitored data in the plant. The calculation of emission reductions have been verified by DNV. It was observed that there was a mistake in calculating the project emission as $OXID_{fuel,\ y}$ as the same was taken from IPCC 1996 version. A CAR was raised by DNV during the verification and the project proponent has subsequently changed the value of $OXID_{fuel,\ y}$ by taking the value from IPCC 2006 version.

3.7 Quality of evidence to determine emission reductions

The clinker production in the plant has been verified from data submitted to the department of central excise, Government of India. The power generation and auxiliary consumption of the power plant has been verified against monthly reports submitted to the Andhra Pradesh Central Power Distribution Company Limited. These reports as well as the daily production log books and the monthly production reports have been considered as the basis for calculations of the emission reductions. Thus it can be concluded that the data reported in the monitoring report is fairly stated.

3.8 External data

The external data used in the project are the combined margin emission factor from the CEA database and the emission factor for sub-bituminous coal from IPCC default values. A combined margin emission factor of 0.85 t CO_2/MWh has been applied. The applied emission factor value have been verified against the sources and found to be correct. The IPCC default value of 96.1 t CO_2/TJ of coal has been used since it results in conservative estimate of the emission reductions as compared to using country specific values for the emission factor of coal. In India, the emission factor of coal is provided by "*India's Initial National Communication to the United Nations Framework Convention on Climate Change*" published by the Ministry of Environment and Forests, Government of India, in 2004. As per page 37 of this document the emission factor for coal is mentioned to be 26.13 t C/TJ which is lower than the IPCC default value of 26.2 t C/TJ. Since, for this project activity the emission factor of coal is required for calculating the project emissions, using the IPCC default value has resulted in conservative estimate of the emission reductions. The project emissions as calculated using the IPCC default values come to 63.823 t CO_2 where as it is 63.630 t CO_2 while using the India specific emission factor value. Thus the use of IPCC default value is acceptable

3.9 Management and Operational System

In order to ensure a successful operation of the project and the credibility and verifiability of the ERs achieved, the project must have a well defined management and operational system. The organisational structure, responsibilities, competencies, non-conformance handling, internal audits and management review for the project was found to be adequate.

3.10 Environmental and Social Indicators

The DNA of India does not require the monitoring of sustainable development indicators and hence no such parameter was identified or monitored. The organisation holds valid Consent to Operate issued by Andhra Pradesh State Pollution Control Board under the Air and Water (Prevention & Control of Pollution) Acts with validity up to 31 December 2007. The organisation has also obtained authorisation for Management & Handling of Hazardous Waste. Annual environmental statement submitted to the state pollution control board has been verified and found to be in order.

3.11 Completeness of monitoring

The monitoring methodology of the project is complete and in accordance with the approved methodology AM0024, version 1, the registered PDD and final validation report. The monitoring plan and the sustaining records are sufficient to enable verification of the emission reductions.

3.12 Accuracy of emission reduction calculations

The accuracy level of the electrical meters, as assessed during calibration by external agencies, was found to be within the specification limit of the meters. The weigh feeders for coal and raw material of clinker production were calibrated by internal laboratory as well as external certified agency. The annual material issue statements from the materials department have been found to be in order.

Calibration records of measuring instruments used in the project were made available during the verification visit and found to be in order.

Emission reduction calculations were presented as a worksheet and DNV has assessed the calculations to be accurate.

3.13 Quality of evidence to determine emission reductions

The emission reductions reported for the period 6 January 2007 to 31 December 2007 was verified to be 47 550 t CO_2e. The anticipated annual emission reduction from the project, as reported in the validated PDD, was 51 527 tones of CO_2e per annum. The difference in the projected figure and the actually monitored figure may be attributed to the difference in the baseline emission factor for the southern regional electricity grid which was 0.9299 t CO_2 /MWh as per the registered PDD instead of 0.85 t CO_2 /MWh as used in the calculations.

The quality and environment management systems implemented in The India Cements Limited has ensured that sufficient evidence be presented for the reported net emission reductions. Internal calibrations and external calibration have been carried out as per the calibration plan. The calibration certificates of the instruments used for data monitoring and recording 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 India Cements WHR Project in India (CDM Registration Reference No. 0717), for the period 6 January 2007 to 31 December 2007.

The project has applied the approved baseline and monitoring methodology AM0024, version 1, and emissions reductions reported in the revised monitoring report version 2 dated 17 March 2008 have been monitored and reported in line with the requirements of the registered PDD, version 5 dated 25 September 2006. DNV has assessed the revised calculations and found them to be correct.

Responsibilities of The India Cements Limited and Det Norske Veritas Certification AS

The management of The India Cements Limited is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions.

It is DNV's responsibility to express an independent verification statement on the reported GHG emission reductions from the project for the period 6 January 2007 to 31 December 2007. DNV expresses no opinion on the baseline determination or on the validated and registered PDD. DNV has verified the correctness of the grid emission factor as sourced from the Central Electricity Authority which has been updated annually for the project activity.

Basis of GHG verification opinion

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 for the period 6 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 amount of GHG emission reductions for the period 6 January 2007 to 31 December 2007 are fairly stated.

We conducted our verification on the basis of the baseline and monitoring methodology AM0024, version 1, and the monitoring plan included in the registered PDD of the project. The verification included:

- *Collection of evidence supporting the reported data,*
- *Checking whether the provisions of the monitoring methodology AM0024, version 1, and the monitoring plan in the PDD were consistently and appropriately applied.*

We have verified whether the information included in the revised monitoring report version 2 dated 17 March 2008 is correct and that the emissions reductions achieved have been determined correctly.

Certification Statement

In our opinion the GHG emissions reductions reported for the project in the revised monitoring report version 2 dated 17 March 2008 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AM0024, Version 1, the monitoring plan and formulae provided in the registered PDD version 5 dated 25 September 2006.

Det Norske Veritas Certification AS is able to certify that the emission reductions from the "India Cements WHR Project in India" for the period 6 January 2007 to 31 December 2007 amount to 47 550 ton CO_2 equivalent.

Bangalore, 30 July 2008

Manager

Climate Change Services

Det Norske Veritas Certification AS

Oslo, 30 July 2008

Technical Director

International Climate Change Services

Det Norske Veritas Certification AS

5 REFERENCES

Documents provided by the Project Participants that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the initial verification conclusions, and are usually further checked through interviews with key personnel.

/1/ *Monitoring Report of India Cements WHR Project version 1 22 January 2008.*

/2/ *India Cements CER calculations.xls*

/3/ *Project data: 2007.xls*

/4/ *Calibration reports of energy meters and weigh feeders*

/5/ *Shift Log Book for WHR Power generation system*

/6/ *Waste heat recovery power plant monthly power generation report, 6 January 2007 to 31 December 2007*

/7/ *Monthly fine coal weight average report from ICL lab, 6 January 2007 to 31 December 2007*

/8/ *Daily raw meal consumption and clinker production report*

/9/ *"India's Initial National Communication to the United Nations Framework Convention on Climate Change", 2004 published by the Ministry of Environment and Forests, Government of India*

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

/10/ *AM0024 version 1 dated 30th September 2005, Baseline methodology for greenhouse gas reductions through waste heat recovery and utilisation for power generation at cement plants.*

/11/ *Project Design Document "India Cements WHR project", Version 5 dated 25th September 2006*

/12/ *SGS Validation report, local assessment checklist, findings overview and report on comments by Parties, stakeholders and NGOs*

/13/ *Installation & Commissioning certificates of WHR boilers & turbine*

/14/ *NCCBM report on determination of kiln feed to clinker conversion factor*

/15/ *Boiler certificates from the Andhra Pradesh Boiler Inspection department*

/16/ *Monthly report on generation submitted to APCPDCL, 6 January 2007 to 31 December 2007*

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