VALIDATION REPORT

UTILISATION OF THE THERMAL ENERGY CONTENT OF THE WASTE GAS OF CLINKER COOLER AND PRE-HEATER FOR POWER GENERATION AT A CEMENT PLANT IN RAJASTHAN

REPORT NO. 2010-0330

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DET NORSKE VERITAS

VALIDATION REPORT

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Client: Birla Corporation Limited		Client ref.: Mr. Sanjay Banthia

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Summary:
Project Name: Utilisation of the thermal energy content of the waste gas of clinker cooler and pre-heater for power generation at a cement plant in Rajasthan
Country: India
Methodology: AM0024
Version: 02.1
GHG reducing Measure/Technology: Waste heat based power generation
ER estimate: 40 026 tCO_2e per year (average)
Size
☒ Large Scale
☐ Small Scale
Validation Phases:
☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues
Validation Status
☐ Corrective Actions Requested
☐ Clarifications Requested
☒ Full Approval and submission for registration
☐ Rejected

In summary, it is DNV's opinion that the project activity "Utilisation of the thermal energy content of the waste gas of clinker cooler and pre-heater for power generation at a cement plant in Rajasthan" in India, as described in the PDD, version 5 of 9 September 2010, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AM0024, version 02.1. Hence DNV requests the registration of the project as a CDM project activity.

Report No.:	Subject Group:
2010-0330	Environment

Report title:
Utilisation of the thermal energy content of the waste gas of clinker cooler and pre-heater for power generation at a cement plant in Rajasthan

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Abbreviations

BCL	Birla Corporation Limited
BCW	Birla Cement Works
BM	Build margin
CAGR	Compounded annual growth rate
CAR	Corrective Action Request
CCW	Chanderia Cement Works
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification request
CM	Combined margin
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CPP	Captive Power Plant
DNA	Designated National Authority
DNV	Det Norske Veritas
DSCR	Debt Service Coverage Ratio
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal rate of return
LoA	Letter of Approval
MoEF	Ministry of Environment and Forests
MP	Monitoring Plan
NEWNE	Integrated Northern, Eastern, Western and North Eastern Electricity Grid
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating margin
PDD	Project Design Document
PPA	Power purchase agreement
BCW	Birla Cement Works
RSPCB	Rajasthan State Pollution Control Board
UNFCCC	United Nations Framework Convention on Climate Change
WHRB	Waste Heat Recovery Boiler

1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the project activity "Utilisation of the thermal energy content of the waste gas of clinker cooler and pre-heater for power generation at a cement plant in Rajasthan" in India. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host Party criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The host Party is India and no Annex I Party is involved in the project at this stage. India fulfils the participation criteria and has approved the project and authorized the project participant Birla Corporation Limited. The DNA from India confirmed that the project assists in achieving sustainable development.

The project correctly applies the baseline and monitoring methodology AM0024, version 02.1 "Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants" /32/.

The project activity is intended to generate power from a 7.5 MW waste heat recovery project in a cement plant and thereby replacing fossil fuel based captive power generation. As a result, the project results in reductions of CO_2 emissions those are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be on the average 40 026 tCO_2e per year over the selected 10 year fixed crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change. The monitoring plan provides for the monitoring of the project's emission reductions

In summary, it is DNV's opinion that the project activity "Utilisation of the thermal energy content of the waste gas of clinker cooler and pre-heater for power generation at a cement plant in Rajasthan" in India, as described in the PDD, version 5 dated 9 September 2010, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AM0024, version 02.1. Hence, DNV requests the registration of the project as a CDM project activity.

Kolkata and Oslo, 5 January 2010

Indrajit Rana.

Indrajit Rana
CDM Validator
DNV India

H.W. Brinks

Hendrik W. Brinks
Technical Director for CDM,
Det Norske Veritas Certification AS

2 INTRODUCTION

Birla Corporation Limited commissioned DNV to perform a validation of the "Utilisation of the thermal energy content of the waste gas of clinker cooler and pre-heater for power generation at a cement plant in Rajasthan" project in India. This report summarises the initial findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board.

2.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and 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 02.1. The validation team has carried out the validation activities based on the recommendations in the CDM executive board Validation and Verification Manual, version 1.2 /31/.

The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

3 METHODOLOGY

The validation consisted of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk review of the project design documentation

The following tables list the documentation that was reviewed during the validation.

3.1.1 Documentation provided by the project participants

/1/ BCL*: CDM PDD for Utilisation of the thermal energy content of the waste gas of clinker cooler and pre-heater for power generation at a cement plant in Rajasthan, version 1, dated 12 August 2009, version 2 dated 1 February 2010, version 3 dated 19 April 2010, version 4 dated 12 June 2010 and final version 5 dated 9 September 2010.*

/2/ BCL: *Board note dated 25 January 2005 and extracts of Board resolution to go ahead with the project activity, dated 31 January 2008.*

/3/ Dalian East New Energy Development Co. Ltd.: *Technical scheme for supply of waste heat recovery boilers and turbo generator dated 18 November 2007.*

/4/ Transparent Energy Systems Pvt. Ltd.: *Technical offer TESPL/QTN/MUM/WHR – 120/220 dated 26 July 2007.*

/5/ BCL: *Contract between BCL and Dalian East Energy Project Co. Limited for the supply of waste heat recovery boilers and turbo generators for the project activity dated 28 May 2008.*

/6/ BCL: *Electricity Bills from Ajmer Vidyut Vitaran Nigam Limited, for the period of April 2006 to March 2007 and for the month of December 2007.*

/7/ BCL: *Annual Report for the year 2008-09 stating that BCW and CCW are subsidiaries of BCL.*

/8/ BCL: *Yearly power consumption data for 2006-07, 2007-08 and 2008-09*

/9/ BCL: *Agreement with Ernst & Young for CDM advisory services, dated 3 March 2008.*

/10/ M/s. Cethar Consulting Engineers (P) Ltd: *Offer for the 7.5 MW coal fired power plant, CCE/10067/07 Rev 00 dated 26 November 2007.*

/11/ RSPCB: *Water Consent to operate the BCL plants, valid up to 30 June 2010*

/12/ RSPCB: *Air Consent to operate the plants, valid up to 20 October 2009*

/13/ RSPCB: *Consent to establish the project activity dated 13 August 2008.*

/14/ BCL: *Single Line Diagram rev.7, dated 5 October 2009.*

/15/ BCL: *Notices issued for stake holder consultation, dated 16 July 2008.*

/16/ BCL: *Response received from stakeholders, dated 21/ 23 July 2008.*

/17/ BCL: *Communication from DNA of India dated 8 May 2009, regarding project presentation on 14 May 2009*

/18/ BCL: *Appointment of DoE for validation of the project on 21 July 2009.*

/19/ BCL: *Cost sheet of captive power plant, for the financial years ending on 31 March 2007 and 31 March 2008.*

/20/ BCL: *Spreadsheet for financial analysis*

/21/ BCL: *Coal analysis report no. CCW/PROD dated 14 April 2010*

/22/ BCL: *Spread sheet for estimation of electricity consumption of BCL, electricity consumption.xls*

/23/ BCL: *Spread sheet for estimation of baseline energy consumption for clinker production, baseline.xls*

/24/ BCL: *Spread sheet for estimation of emission reductions from the project activity, ER.xls*

/25/ A-Tec Asia Bhd. Sdn., Malaysia: *Technical offer for up gradation of clinker production capacity of CCW to 4050 MT/day, dated 23 February 2007.*

/26/ BCL*: Letter of Intent awarded to Dalian East Energy Project Co. Ltd. HO/CCW/WHRS/07-08 dated 20 February 2008*

/27/ BCL: Contracts supply and erection of equipment and structural:

Job orders to Lloyd Insulations(India) Limited,(1) No.4T/GJ/100004/2912, dated 28 May 2010, (2)4T/HP/100066/2912, dated 28 May 2010, (3))4T/BP/100048, dated 17 May 2010, (4) No.4T/GJ/100003, dated 17 May 2010,

Purchase order to SangirPlastics Private Limited, No.4T/HP/100036, dated 29 April 2010

Purchase order to Safex Equipment Pvt Limited, No.4T/HP/90002, dated 22 May 2010

Purchase order to Mather and Platt Pumps Limited,(1) No.4T/HP/90003, dated 2 June 2009, (2) No.4T/EP/90044, dated 4 November 2009

Purchase order to Paharpur Cooling Towers Ltd, No. (1) 4T/HP/90004, dated 19Jan 2010 (2) 4T/HP/90011, dated 22 Jan 2010

Purchase order to Escorts Construction Equipment Limited, No.4T/HP/90022, dated 12 September 2009

Purchase order to Rajinder Alloys Limited, No.4B/GP/90025, dated 7 October 2009

Purchase order to Turbovent IndustriesPvt Ltd, No.4T/HP /90045, dated 20 November 2009

Purchase order to Engineers & Engineers(Elect) Pvt Ltd, No.4T/EP/100028, dated 22 April 2010

Purchase order to Danfoss Industries Pvt Ltd, No.4T/EP/90124, dated 24 Feb 2010

Purchase order to Nursing Sahay Madangopal, (1)No.4T/EP/90053, dated 11 Dec 2009, (2) No.4T/EP/90077, dated 13 Jan 2010

Purchase order to Fluidcon Engineers, No.4T/BP/90075, dated 12 Jan 2010

Purchase order to P.P. Minerals, No.4T/AP/90102, dated 31 Jan 2010

Purchase order to Laizhou Mingfa Thermal Insulation, China, No.4T/HP/90002, dated 4 October 2009

Purchase order to Sigmaflex Engineering Pvt Limited, No.4T/BP/10049, dated 17 May 2010

Fabrication & Erection contract for steel structure to Ahluvalia Erectors, WT/94005 dated 27 August 2009.

/28/ Cethar Consulting Engineers Private Ltd.: *Project cost estimation for the waste heat recovery based power generation system in Chanderia and Satna, dated 5 January 2008.*

/29/ Dalian East Energy Project Company Ltd.: *Certificate on specific energy consumption of clinker and lifetime of the project activity.*

3.1.2 Letters of approval

/30/ Ministry of Environment & Forests (DNA of India): *Letter of approval no.4/9/2009-CCC dated 30 November 2009*

3.1.3 Methodologies, tools and other guidance by the CDM Executive Board

/31/ CDM Executive Board: *Validation and Verification Manual. version 1.2*

/32/ CDM Executive Board: *AM0024, version 02.1, Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants*

/33/ CDM Executive Board: *Tool for demonstration and assessment of additionality, version 5.2*

/34/ CDM Executive Board: *Guidance on Assessment of Investment Analysis, version 3.1.*

/35/ CDM Executive Board: *Guidance on the demonstration and assessment of prior consideration of the CDM, version 3*

/36/ CDM Executive Board: Glossary of CDM terms, version 5.

3.1.4 Documentation used by DNV to validate / cross-check the information provided by the project participants

/37/ Central Electricity Authority: *CO_2 baseline database version 4 available in the web site* www.cea.nic.in

/38/ Government of India*: Indian Income Tax Act 1961, Section 32 (Rule 5) Appendix 1 and Section 80-1A, paragraph 2.0*

/39/ Reserve Bank of India: *Weekly statistical supplement on Cash Reserve Ratio and Interest Rates, dated 4 January 2008.*

/40/ India's Initial National Communication – *Chapter 2 – 'Greenhouse Gas Inventory Information, dated 16 June 2004: The national values of emission factor of coal*

/41/ Cement Manufacturer's Association (CMA): *Highlights of Indian Cement Industry, as on 31 March 2009* http://www.cmaindia.org/industry.html

/42/ Ministry of commerce industry: *Yearly wholesale price index* http://eaindustry.nic.in/

/43/ UNEP Risoe: CDM/JI Pipeline Analysis and Database http://cdmpipeline.org/publications/CDMpipeline.xlsx

/44/ Cement Manufacturer's Association(CMA): Technical Committee meeting, agenda for the 45th meeting dated 9 July 2010.

/45/ CEA: Report of the expert committee on fuels for power generation, February 2004. http://www.cea.nic.in/thermal/Special_reports/Report%20of%20the%20expert%20committee%20on%20fuels%20for%20power%20generation.pdf

/46/ Official web site of DNA of India: http://cdmindia.nic.in/cdmindia/projects/1596-09.doc.pdf

3.2 Follow-up interviews with project stakeholders

On 9 October 2009 DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. A site-visit was performed in the project location wherein Indrajit Rana and Ravi Kumar Prabhu of DNV conducted the on-site visit and representatives of Birla Corporation Limited were interviewed. The main topics of the interviews are summarized below.

Name	Interview Topics
Birla Corporation Limited Mr. V.K. Hamirwasia, President Mr. A. Jha, Sr. Vice President (Production) Mr. K.R. Karwa, Sr. Vice President (Engineering) Mr. D.C. Jagetia, Manager (Operation) Mr. Mukesh Birla, Manager (Instrumentation) **Ernst & Young** Mr. Sudipta Das, Consultant Mr. Shyamasis Das, Associate Consultant) **Local stake holder** Mr. Kailash Panwar, Councilor Mr. M.S.Bhati, NGO	➢ Proof of CDM consideration ➢ Applicability of methodology ➢ Determination of baseline ➢ Assessment of project additionality and discussed barriers ➢ Emission reduction calculations and data used ➢ Review of project design and technology used ➢ Review of monitoring and verification procedure of the organisation and management structure of the organization for the project activity. ➢ Environmental consents and permits ➢ Review of the stakeholder consultation process.

The main difference between the web hosted PDD and the final PDD are:

a) The investment comparison analysis method changed from levelized cost analysis to IRR analysis as per the applicable methodology AM0024 version 02.1.
b) The region selected for common practice analysis changed from the state of Rajasthan to India.
c) The CERs have been revised from 39 727 to 40 026 due to rectification of error in station heating rate used in ER calculation.
d) The source of emission factor of coal is revised from IPCC default value of 96.1 tCO_2/ TJ to national value of 95.81 tCO_2/TJ
e) The starting date of crediting period has been revised.

3.3 Resolution of outstanding issues

The objective of this phase of the validation is to resolve any outstanding issues which need be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of four tables. The different columns in these tables are described in the figure below. The completed validation protocol based on the latest version of the PDD for the project activity "Utilisation of the thermal energy content of the waste gas of clinker cooler and pre-heater for power generation at a cement plant in Rajasthan" in India is enclosed in Appendix A to this report. The original validation protocol prepared on the basis of the web hosted PDD is also attached as Appendix B to this report to maintain the history of validation.

A corrective action request (CAR) is raised if one of the following occurs:

(a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

(b) The CDM requirements have not been met;

(c) There is a risk that emission reductions cannot be monitored or calculated.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

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

Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities		
Requirement	***Reference***	***Conclusion***
The requirements the project must meet.	*Gives reference to the legislation or agreement where the requirement is found.*	*This is either acceptable based on evidence provided (**OK**) or a **corrective action request (CAR)** if a requirement is not met.*

Validation Protocol Table 2: Requirement Checklist				
Checklist question	***Reference***	***Means of verification (MoV)***	***Assessment by DNV***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the CDM-PDD	*Gives reference to documents where the answer to the checklist question or item is found.*	*Means of verification (MoV) are **document review (DR)**, **interview (I)** or any other follow-up actions (e.g., on site visit and telephone or email interviews) and **cross-checking (CC)** with available information relating to projects or technologies similar to the proposed CDM project activity under validation.*	*The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.*	*OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A c**orrective action request (CAR)** is raised when project participants have made mistakes, the CDM requirements have not been met or there is a risk that emission reductions cannot be monitored or calculated. A **clarification request (CL)** is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. A **forward action request (FAR)** during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.*

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Corrective action and/ or clarification requests	***Ref. to checklist question in table 2***	***Response by project participants***	***Validation conclusion***
*The **CARs** and/ or **CLs** raised in Table 2 are repeated here.*	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants to address the CARs and/or CLs.*	*The validation team's assessment and final conclusions of the CARs and/or CLs.*

Validation Protocol Table 4: Forward Action Requests		
Forward action request	***Ref. to checklist question in table 2***	***Response by project participants***
The FARs raised in Table 2 are repeated here.	*Reference to the checklist question number in Table 2 where the FAR is explained.*	*Response by project participants on how forward action request will be addressed prior to first verification.*

Figure 1: Validation protocol tables

3.4 Internal quality control

The validation report underwent a technical review performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation team

				Type of involvement						
Role	***Last Name***	***First Name***	***Country***	Administrative	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	Sectoral competence
Project manager	Rana	Indrajit	India	✓						
Technical team leader (CDM validator)	Rana	Indrajit	India		✓	✓	✓	✓		
GHG auditor	Prabhu	Ravi Kumar	India		✓	✓	✓			
Person with sectoral competence	Jayaram	Santhosh	India		✓					✓
Technical reviewer	Biswas	Soumik	India						✓	
Person with sectoral competence assisting technical reviewer	Yang	Xiao Shan, Alan	China						✓	✓

The qualification of each individual validation team member is detailed in Appendix C to this report.

4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The final validation findings relate to the project design as documented and described in the PDD, version 5 dated 9 September 2010.

4.1 Participation requirements

The project participant is the private entity Birla Corporation Limited of India. No Annex-I Party project participant is involved in the project yet. The host Party India meets all the requirements for participating in a CDM project /30/.

A letter of approval (LoA) /30/ was received from project participants. The issuance of LoA has also been cross checked from the official web site of the DNA of India /46/. DNV consider the letter is in accordance with paragraphs 45-48 of the VVM /31/.

4.2 Project design

The project is located at the plant premises of Chanderia Cement Works (CCW) and Birla Cement Works (BCW), which are the fully owned cement manufacturing units of Birla Corporation Limited, Chanderia, in the state of Rajasthan in India /7/. The project entails utilization of the heat content of the waste gas from pre-heaters and clinker cooling sections of the clinker production lines of BCW and CCW for generation of power in a waste heat recovery based power plant. The power generated by the project activity will partially meet the electrical energy requirement after capacity expansion of the cement plants of Birla Corporation Limited, Chanderia. The BCW has two kilns having capacity of 1000 MT/day each. Thus clinker production capacity of BCW is 2 000 MT/day. The CCW has one kiln. The capacity of CCW clinker was 3 500 MT/day, which is being expanded to 4 050 MT/day /25/.

The project activity involves the installation of the following equipments /3/:

- One boiler downstream of the Kiln No. 1 pre-heater at BCW to generate high pressure steam at 24 Bar.
- Two boilers downstream of the Kiln No. 2 pre-heater at BCW to generate high pressure steam at 24 Bar and low pressure steam at 3 Bar respectively,
- Two boilers downstream of the pre-heater at CCW to generate high pressure steam at 24 Bar and low pressure steam at 3 Bar respectively.
- One high pressure steam boiler to generate high pressure steam at 24 Bar and one low pressure steam at 3 Bar at the downstream of the clinker cooler at CCW.

- One 7.5 MW generator driven by a condensing type turbine, utilizing the high pressure steam and low pressure steam from the seven WHR boilers.

The WHR boilers and the generator are supplied by M/s. Dalian East Energy Project Co. Ltd., China /5/. The total steam requirement of the turbo generator is being made available by WHR boilers installed as part of the project activity. As per the conventional clinker manufacturing process, the flue gases emanating from clinker cooler and pre-heater are vented to the atmosphere without heat recovery, except for a small portion used to pre-heat the incoming raw materials and fuel. In the project scenario, the waste gases from clinker cooler and pre-heater will be introduced into the Waste Heat Recovery Boiler (WHRB) where the heat content of the kiln gases will be extracted and utilized for generation of steam. The waste gas used for pre-heating raw materials and fuel will continue to be used even after implementation of the project. After 8% auxiliary consumption, 34.81 GWh/annum electricity will be supplied to the cement plants of Birla Corporation Limited, Chanderia. The technical details of the WHRBs and turbo generator have been verified from the technical scheme of the equipment /3/.

In absence of the project activity, the equivalent amount of electricity would have been sourced from the new coal based captive power plant which would be the extension of existing fossil fuel based CPP. The waste heat recovery boiler and the steam turbo generator have been designed and supplied by M/s. Dalian East Energy Project Co. Ltd., China and reflects good engineering practice.

The project is presently under construction. The lifetime of the project is stated to be 25 years according to the certificate provided by Dalian /29/, which is deemed reasonable. The project has selected a fixed crediting period of 10 years starting from 1 April 2011, or from the date of registration, whichever is later. The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA.

The starting date of the project activity has been selected as 28 May 2008 which is the date on which the contract /5/ have been signed for main equipment (WHRB and steam turbo generator) required for the project activity. This is the first financial commitment for the project activity. The project is presently under construction. The lifetime of the project is stated to be 25 years according to the certificate provided by Dalian /29/, which is deemed reasonable. The project has selected a fixed crediting period of 10 years starting from 1 April 2011, or from the date of registration, whichever is later. The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA.

DNV considers the project description of the project contained in the PDD to be complete and accurate. The PDD complies with the relevant forms and guidance for completing the PDD.

4.3 Application of selected baseline and monitoring methodology

The methodology AM0024 version 02.1, "*Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants*" was applied for the baseline determination.

DNV was able to verify that the project meets all applicability criteria of the baseline methodologies as stated below:

- The project involves generation of electricity from clinker waste heat, which has been verified from the contract for the supply of waste heat recovery system /5/.
- The entire electricity generated will be used within the industrial facility for captive consumption. The power requirement of BCL is presently met mainly by a coal based captive power plant and the balance through imports from the grid. The verification of electricity bills /6/ shows that the BCL imports power from the grid to make up the shortfall in captive production and the power generated by the project activity can be consumed internally.
- Energy generated by the project activity will replace the power from an identifiable generation source. BCL is implementing a project to enhance the clinker capacity of CCW from 3 500 MT/day to 4 050 MT/day /25/, which is expected to be completed during 2010-11. The additional requirement of the proposed expansion would have been met from coal based power plant, since the capacity of the existing CPP is inadequate /22/ and the cost of grid power is high (4.81 INR/kW /6/ compared to 2.8 INR/kW /19/ for captive coal based generation).
- New coal fired power plant is the identified generation source. In India, there is no regulatory barriers in establishment of the coal based CPP in cement plants. The new coal based CPP as an extension of the existing CPP is the identified generation source, as stated above.
- The waste heat is used in the project activity alone. This has been verified from the contract for supply of WHRBs /5/.
- In the baseline, a part of the waste heat from the gas is captured to preheat the incoming raw materials and fuel (Type 1 activity) and the rest is vented out. This has been verified during the site visit.
- The current use of waste heat or identified alternative business as usual use of waste heat is not located outside the boundary of the clinker making process (Type 2 activity). During the site visit, it was verified that the waste gas was vented without heat recovery, except for a small portion used for pre-heating of raw materials.
- The project activity will not affect process emissions from the cement plants. The technology supplier confirmed that the project will not change the specific fuel consumption of clinker /29/, from which it can be concluded that there will be no impact on the emissions from cement plant. Further, the specific energy consumption per tonne of clinker produced will be monitored and will be accounted as project emissions if there is any increase.

The assessment of the project's compliance with the applicability criteria of AM0024 (version 02.1) are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

4.4 Project boundary

The project boundary includes the cement manufacturing units of BCL, the waste heat sources (rotary kilns generating the waste heat for the project), heat recovery boilers, turbo generator and electrical distribution system of BCL and the NEWNE grid of India. The selected sources and gases are justified for the project activity.

The system boundaries may be presented in tabular format:

	GHGs involved	*Description*
Baseline emissions	CO_2	Emissions equivalent to the amount of net electricity supplied by the project activity that would otherwise be generated by new coal based captive power plant.
Project emissions	CO_2	The increase in specific energy consumption per tonne of clinker production may be an emission source as per the provisions of the methodology.
Leakage	NA	NA

The identified boundary and selected sources and gases are justified for the project activity. The validation of the project activity did not reveal other greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed project activity which are expected to contribute more than 1% of the overall expected average annual emission reduction, which are not addressed by AM0024 (version 02.1).

4.5 Baseline determination

During the site visit, DNV verified that most of the waste heat from pre-heater and clinker cooler in the clinker production lines of BCL was being vented to the atmosphere in the baseline scenario. Only a small portion of the waste heat was used in the clinker section to pre-heat the raw materials. Therefore the project activity falls into the category of Type 1 waste heat utilization as per the methodology /32/. The waste heat is generated during the clinker production and has direct impact on the fuel consumption, which is reflected in the specific fuel consumption of the clinker. The venting of waste heat from pre-heater and clinker cooler is the current practice of similar plants in India, cf. Section 4.6.5. DNV has also confirmed during the site visit that there is no possibility of utilising the waste heat by other users in the locality. Measurement of the specific fuel consumption per unit clinker before and after the project implementation would capture any change in emission resulting from this change in Type 1 waste heat flows.

The electricity consumption from production records /8/ for the years 2006-07, 2007-08 and 2008-09 shows that the electricity requirement of BCL is mostly met from the coal based captive power plant and the rest is imported from the grid. Furthermore, BCL is planning to expand the capacity of CCW clinker plant from 3 500 MT/day to 4 050 MT/day, which will entail additional power requirement for clinker production as well as grinding. This additional electricity demand can be met by either imports from grid or by installing a new coal based power plant. The historical operation data of the plant suggest that the majority of the power requirement of the plant was met by captive generation with only the surplus demand after exhausting the captive generation was imported from the grid. It is thus reasonable to assume that this trend would be continued in the future also. The variables E_{load} and EG_{cement} calculated in line with the methodology indicate that the power generated by the project activity can be fully absorbed by the cement manufacturing plants of BCL at Chanderia. The spreadsheet for E_{load} and EG_{cement} calculated on the basis of the two year consumption figures prior to the start date /22/, and the data provided in the PDD /1/, have been verified against the

plant records /8/. The calculations show that BCL will continue to import power from the grid even after implementation of the project activity.

Step 1: Determination of technically feasible alternatives
The credible and realistic alternatives to the project activity identified are as follows:
Alternative 1: The project activity undertaken without being registered as a CDM project activity.
Alternative 2: Installation of a new coal based power plant of 5.4 MW capacity as an extension of the existing 29.8 MW captive power plant and releasing the waste heat (available after type 1 waste heat utilization) to atmosphere. The capacity of the baseline plant (5.4 MW) has been selected based on the coal based plant capacity required to generate equivalent power that would have been generated from the project (34.81 GWh/annum which is the estimated power generation from the project activity).
Alternative 3: Import of electricity from NEWNE grid of India and continue venting of waste heat to atmosphere. However the cost of grid power is much higher than that of alternative 1 & 2. This is shown in the investment analysis below where the IRR relative to alternative 3 is carried out for alternative 1 and 2, both showing high financial viability. The historical operation data of the plant also suggest that the majority of the power requirement of the plant was met by captive generation with only the surplus demand after exhausting the captive generation was imported from the grid. It is thus reasonable to assume that this trend would be continued in the future also. Alternative 3 is not a realistic and credible alternative as shown below.
Alternative 4: Captive power generation based on different fuel options. The diesel based power generation is not a plausible alternative considering the high cost of diesel in India. Further, natural gas is not available at the plant location, which was verified during the site visit. Hence Alternative 4 is not a realistic and credible alternative for the project activity.

Step 2: Compliance with regulatory requirements
DNV consider the list of alternatives to be realistic, credible and complete. Both the alternatives 1, 2 & 3 are in compliance with the regulatory requirements.

Step 3: Economic analysis
Under section 4.6.3, an investment comparison with project IRR as the financial indicator were carried out for the proposed project (alternative 1) and the new coal based captive power plant and releasing the waste heat (available after type 1 waste heat utilization) to atmosphere (alternative 2) /20/. It has been observed that relative to purchasing electricity from the grid (alternative 3), the 19.02% IRR of alternative 1 is lower than the 29.91% IRR of alternative 2. As per applicable methodology AM0024 version 02.1 the option with the highest IRR is the baseline scenario**.** Therefore the new coal based captive power plant and releasing the waste heat (available after type 1 waste heat utilization) to atmosphere is considered to be the most realistic baseline, i.e. alternative 2.

The approved baseline methodology has been correctly applied to identify a complete list of realistic and credible baseline scenarios, and the identified baseline scenario most reasonably represents what would occur in the absence of the proposed CDM project activity.

All the assumption and data used by the project participants are listed in the PDD and/or supporting documents. All documentation relevant for establishing the baseline scenario are

correctly quoted and interpreted in the PDD. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.

4.6 Additionality

The additionality of the project has been established using the "Tools for the demonstration and assessment of additionality" version 5.2 approved by the CDM-EB /33/. The project activity demonstrates the additionality through the investment analysis and common practice analysis.

4.6.1 Evidence for prior CDM consideration and continuous actions to secure CDM status

The starting date of the project activity has been selected as 28 May 2008 which is the date on which the contract /5/ was signed for main equipment (WHRB and steam turbo generator) required for the project activity and this is the first financial commitment for the project activity. The other major orders placed after the start date includes the following /27/:

Fabrication & Erection contract for steel structure to Ahluvalia Erectors, WT/94005 dated 27 August 2009.

Purchase order to Escorts Construction Equipment Limited, No.4T/HP/90022, dated 12 September 2009

Purchase order to Laizhou Mingfa Thermal Insulation, China, No.4T/HP/90002, dated 4 October 2009

Purchase order to Mather and Platt Pumps Limited,(1) No.4T/HP/90003, dated 2 June 2009, (2) No.4T/EP/90044, dated 4 November 2009

CDM was seriously considered in the decision to proceed with the project as confirmed through:

- Early consideration of CDM is evidenced by Board of Directors resolution of BCL /2/, dated 31 January 2008, in which the CDM benefits were considered.
- BCL has appointed M/s Ernst & Young as consultants for the CDM project on 3 March 2008 /9/.

The assessment that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation is summarized below:

- BCL invited local stakeholder comments by sending letters on 16 July 2008 /15/.
- Project participant made presentation to DNA of India as part of the requirement for obtaining LoA, on 14 May 2009 /17/.
- Appointment of DOE for validation of the project on 21 July 2009 /18/.
- Start of validation by web-hosting of PDD for global stakeholder consultation on 18 September 2009.

It has been evidenced from the above chronology of events that the time gap between two events for securing CDM status for the project activity is less than two years which implies the continuous procedures towards securing CDM status and demonstrates sufficient efforts to secure CDM status in parallel with the implementation.

It is DNV's opinion that the proposed CDM project activity complies with the requirements of the latest version of the guidance on prior consideration of CDM.

4.6.2 Identification of alternatives to the project activity

The project's additionality is demonstrated using "Tool for the demonstration and assessment of additionality", version 5.2, /33/ .

Four alternatives to the project activity have been considered as the baseline scenario. These are i) project activity undertaken without CDM benefits, ii) generation of power in a coal fired 5.4 MW plant as an extension of the existing captive power plant and releasing the waste heat (available after type 1 waste heat utilization) to atmosphere iii) import of power from the NEWNE grid and iv) captive power generation based on different fuel options.

As discussed in section 4.4, alternative (iv) was eliminated because of the high cost of diesel and non availability of natural gas at the project site. Alternative (iii) was eliminated based on the financial analysis shown below that both alternative 1 and 2 show positive project-IRR relative to alternative 3, i.e. when the financial analysis is done based on the savings compared to the cost of grid power and.

Alternatives (i) and (ii) are in compliance with the laws and regulations of India. The project proponent has calculated the post tax project IRR /20/ for these two alternatives and has considered the alternative with highest IRR as the baseline in line with the methodology. The IRR comparison establishes that alternative ii) has the highest IRR among the two alternatives and has hence been selected as the most likely baseline scenario.

4.6.3 Investment analysis

Choice of approach

The CDM project activity and the alternative identified in section 4.5.2 generate financial or economic benefits other than CDM related income. Both alternative 1 and 2 involve investments. Therefore an investment comparison analysis with project-IRR as the financial indicator is justified.

Input parameters

The assumptions used in the investment comparison analysis are deemed appropriate and the values were verified/cross-checked from the documents shown in the following table.

Inputs values	Value used for financial analysis	Documents verified/cross-checked
Project cost inclusive of 7 WHR boilers and one 7.5 MW turbo generator.	INR 650 million	The project cost was verified from the note to the Board and the Board resolution /2/, deciding to proceed with the project activity, the basis of which is the estimate prepared by Cethar

		Consulting Engineers Private Ltd. /28/. The project cost was cross-checked against the contracts for supply and erection of the equipments and structurals amounting to INR 443.5 million /27/, which constitutes 68.23% of the total estimated project cost. The project is still under implementation and many purchase/work orders are yet to be placed. Thus estimated project cost is deemed realistic. DNV has also checked the IRR analysis with the project cost INR 443.5 million and it is found that the project IRR is 27.01% which is till less than the baseline IRR 29.91%. Based on the above discussion DNV concludes that the project cost is appropriate.
Baseline cost inclusive of coal fired boiler and 5.4 MW turbo generator	INR 246.332 million	The baseline cost is calculated on pro rata basis depending on the offer from M/s. Cethar Consulting Engineers (P) Ltd. for the 7.5 MW coal fired power plant /10/. According to the report of CEA /45/, the estimated cost of coal based power plant in 2004 was INR 40 million/MW. Considering the increase of CAGR 6% in the commodity prices since 2004 /42/, the cost in 2007 would have been INR 47.6 million /MW and 257 million for 5.4 MW. Hence it is DNV's opinion that the baseline cost is deemed appropriate.
Cost of coal	INR 1 800/MT	The coal cost was verified from the note to the Board

		/3/. The same was cross-checked against the cost sheet of power plant /19/, according to which the average coal cost was INR 1819.52 for the year 2006-07, the latest yearly data available at time of decision making. DNV verified that baseline IRR is 29.75% with a coal cost of INR 1 819.52/MT of coal against the IRR of 29.91% with INR 1 800/MT and has no significant impact on the investment decision. The cost of coal at INR 1 800/MT is deemed appropriate.
Annual escalation of coal cost	4.86	Escalation rate is verified from the web site of Ministry of commerce industry: yearly wholesale price index for non coking coal for the period 2002-03 to 2007-08 /42/.
Annual net power exported to the cement plant	34.81 GWh.	Net generation is considering 5.8 MW for 273 days (about 20 hours/day) when the raw material/fuel pre-heaters are on line and 7.5 MW for 57 days (about 4 hrs/day) when the pre-heaters are offline, PLF and auxiliary consumption. The basis for projected power generation was verified from the technical offer of Dalian /3/.
Auxiliary power consumption for WHRB	8%	The auxiliary consumption was verified from the technical offer of Dalian /3/.
Auxiliary power consumption for new CPP in baseline	10%	The auxiliary consumption was verified from the offer of M/s. Cethar Consulting Engineers (P) Ltd. for the coal fired power plant /10/.
Availability of WHRB	The WHRB will operate for 330 days at a load of 5.8 MW for 20 hours when part of the	The estimated PLF and plant availability have been validated from the technical

	waste gas will be diverted for pre-heating of raw materials and at 7.5 MW for 4 hours when all the waste gas will be used for power generation. Plant load factor of 80% is used considering variations in clinker production, gas flow, and temperature, Plant availability of 98%	offer of Dalian /3/.
Availability of new CPP in baseline	Plant availability of 90%	The plant availability guaranteed was verified from the offer of M/s. Cethar Consulting Engineers (P) Ltd. for the coal fired power plant /10/.
Operation and Maintenance cost WHRB	1.5% of total project cost	The O&M cost was verified from the note to the Board /3/. The O&M cost of baseline plant works out to 2.9% of the plant cost. The O&M cost of project activity at 1.5% is reasonable considering that 7 WHR boilers are being installed and is lower than the baseline O&M cost in % terms.
Operation and Maintenance cost new CPP in baseline	INR 0.24/kWh	The O&M cost was verified from the note to the Board /3/ and cross checked against the actual O&M cost of the existing captive power plant for the year 2006-07 /19/.
Annual escalation of O&M cost	4.33%	Escalation rate is verified from the web site of Ministry of commerce industry: yearly whole sale price index for all commodities /42/.
Design station heat rate of coal fired boiler	2 867 kcal/kWh (corresponding to 30% efficiency)	Station heat rate was verified from the offer of M/s. Cethar Consulting Engineers (P) Ltd. for the coal fired power plant /10/.
NCV of coal	3 700 to 3 800 kcal/kg	NCV of coal was verified from the offer of M/s. Cethar Consulting Engineers (P) Ltd. /10/ and cross checked

		against the analysis report of coal /21/ at 3 875 kcal/kg.
Grid electricity tariff	INR 4.81/kWh	The tariff was verified from the note to the Board /3/. The same was cross-checked against from electricity bills issued by Ajmer Vidyut Vitaran Nigam Limited for the month of December 2007 /6/.
Annual escalation of tariff	1.98%	Escalation rate is verified from the web site of Ministry of commerce industry: yearly wholesale price index for electricity for industry /42/
Debt to equity ratio	2:1	The debt: equity ratio was verified from the note to the Board /3/.
Interest rate on term loan	12.5%	The interest on term loan was verified from the Reserve Bank of India's third quarter review of annual statement on monitory policy for the year 2007-08 /39/.
Depreciation, Income Tax, salvage value	Depreciation rate for plant & machinery @ 5.28% and 3.34% for civil works were considered for financial analysis and the residual value is accounted during the 20th year. The income tax is calculated at the rate of 33.99%	The depreciation and Income Tax rates were verified from the note to the Board /3/ and cross-checked against the Indian Income Tax Act 1961 /38/.

The IRR of the two alternatives are listed below /20/:

- Alternative 1: Project activity undertaken without CDM benefits had an post tax project-IRR of 19.02%,
- Alternative 2: Generation of power in a coal based 5.4 MW plant as an extension of the existing captive power plant had a post tax project-IRR of 29.91%.

To meet the uniformity of the financial analysis total out put from both the alternatives has been fixed at 34.81 GWh/annum which is the guaranteed power generation from the project activity /3/.

Calculation and conclusion

From the investment comparison analysis of the project activity and the alternative, it has been found that the alternative-2, generation of power in a coal fired 5.4 MW plant as an extension of the existing captive power plant had the highest IRR amongst all plausible

alternatives including the project activity without CDM revenue /20/. It may therefore be concluded that the project activity can not be considered as the most financially attractive proposition.

The IRR calculations were provided in a spreadsheet /20/. The calculations and assumptions used in the calculations were deemed to be correct by DNV. The project-IRR without CDM revenues at 19.02% is lower than the 29.91% for the alternative 2 and confirms that the project in the absence of CDM benefits is not financially attractive.

Sensitivity analysis

To make investment comparison analysis robust and realistic, a sensitivity analysis has been done by varying the values of input parameters which has more than or equal to 20% contribution in either total project costs or total project revenues. Project proponent has done the baseline sensitivity analysis by variation of project cost, coal price, grid power tariff, O&M costs and power generation from waste gas /20/. No significant positive correlation were found between the parameters.

a) **Project cost**: The IRR touches the baseline IRR of 29.91% if the project cost decreases by 39.12%. Since the project activity is under implementation stage and the actual investment cost incurred so far verified from the purchase orders provided /27/ totals INR 443.5 million (68.5% of the estimated cost), thus the 39.12% reduction in investment cost is not possible.

b) **Electricity generation:** With the electricity generation increased by 64.25%, the project IRR touches the baseline IRR of 29.91%. The estimated electricity exported from the project activity (34.81 GWh) considering the waste heat availability (80%) and plant availability (98%) considered in the financial analysis is based on the technical scheme provided by Dalian /3/. Further DNV has cross checked the electricity generation by considering waste heat availability (100%) and plant availability (100%), the IRR improves only to 23.86%. Thus the electricity generation increase by 64.25% is not possible.

c) **Tariff:** The project IRR improves to the applied baseline IRR of 29.91% if the tariff increases by 64.25%. However, since the IRR is calculated on the basis of savings with respect to the grid power, the increase in tariff will also result in similar improvement in baseline IRR. Thus the increase in tariff will not have impact on the sensitivity analysis.

d) **O&M costs:** The project IRR touches the baseline IRR of 29.91% when the O&M cost is reduced by 1015%, which is not possible. Further, with the O&M costs reduced by 100%, the project IRR improves to 20.1% only.

e) **Coal costs:** The project IRR touches the baseline IRR of 29.91% when the coal cost increases by 62.05%. The compounded annual growth rate (CAGR) of the non-coking coal price in India during the last 10 years is 6.04%. Furthermore, in India the coal price is regulated by the Government. Hence increase in coal cost by 62.05% is unlikely.

4.6.4 Common practice analysis

For assessing the common practice analysis, all the cement plants operating in India are considered. Since the cement plants in India operate under the same set of economical, environmental and political conditions, the choice of the region, scale and technology for the common practice analysis is deemed justified. As per the data base of Cement Manufacturer's Association, /41/ there are 148 cement plants in India as of 31 March 2009. Among the 148 cement plants in India, only 7 other plants have installed/installing WHRB for power

generation and all of them have considered CDM benefit for implementation of the same. This has been verified from the list of CDM projects published in CDM pipeline /43/. Hence it can be concluded that WHRB based power generation is not a common practice for cement plants in India and the installation of such WHRB is feasible only with CDM benefit.
From the above discussion it can be concluded that the project is not a business-as-usual scenario and thus additional.

4.7 Monitoring

The project applies the approved monitoring methodology AM0024 version 02.1, "*Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants*". The selected monitoring methodology is applicable for the project activity as it involves waste heat recovery and utilization for power generation at cement plants.

All the data collected under the monitoring plan will be kept for 2 years after the end of crediting period or till the last issuance of CERs, whichever is later. The monitoring plan stated in the PDD is feasible and the project participants have ability to implement it. The monitoring plan is in accordance with the monitoring methodology and will give opportunity for real measurements of achieved emission reductions.

Monitoring of sustainable development indicators is not required by the DNA of India.

The project monitoring plan is in compliance with the monitoring methodology AM0024 (version 02.1).

It is DNV's opinion, that the project participant are able to implement the monitoring plan.

4.7.1 Parameters determined ex-ante

The following parameters are determined *ex-ante* and verified by DNV.

Parameters	Unit	Value applied	Description and source of data used
F_B	TJ	CCW: 4 022 TJ BCW: 2 280 TJ Total: 6 303	The average annual energy consumption of clinker making process estimated prior to the start of operation of the project activity /22/.
$O_{clinker,B}$	t	CCW: 1 336 500 tons BCW: 660 000 tons Total: 1 996 500 tons	The average annual output of clinker estimated prior to the start of operation of the project activity /22/.
EI_B	TJ/t	0.0032	Pre-project energy consumption per unit output of clinker in TJ/ton of clinker produced. This is a calculated parameter. The parameter has been calculated based on the following equation $EI_B = \frac{F_B}{O_{clinker,B}}$

$COEF_{IGS}$	tCO_2/ TJ	95.81 (considering sub-bituminous coal)	Emission coefficient of the fuel (*i.e.* coal) used in identified generation source, expressed as tCO_2/GJ, lower heating value. Sourced from national values of emission factor of coal /40/.
$EG_{ATEXIST}$	MWh	180 552	Net electricity generation of the existing captive generation plant estimated prior to project implementation based on historical data /8/, /22/
E_{CEMENT}	MWh	226 206	Electricity consumption of cement works prior to the start of operation of the project activity /22/.
E_{LOAD}	MWh	1 489	Electricity consumption of other load in the cement works complex prior to project /22/.
FI_{IGS}	GJ/ MWh	12.0	Fossil fuel (*i.e.* coal) consumption rate of the identified generation source (IGS) to supply $EG_{Y,}$ expressed as GJ per MWh /10/.

As per the requirement of the methodology, regulations and/or policy that could influence the use of waste heat and generation of power in the region would also be monitored.

4.7.2 Parameters monitored ex-post

According to AM0024 and "Tool to calculate the emission factor for an electricity system" version 02.1, the following data and parameters should be monitored:

Parameter	unit	Recording frequency	Monitoring equipment/ data source	Data variable
$EG_{CP,Y}$	MWh	Measured continuously, recorded monthly,	Energy Meter, calibrated annually	Quantity of electricity supplied to cement plant from the project activity.
$NCV_{fuel,y}$	TJ/t	Measured annually	In-house lab report or analysed by an independent third party	Calorific value of fuel (coal) used in clinker production.
$COEF_{fuel,y}$	tCO_2/ TJ	Calculated/ estimated annually	'India's Initial National Commission' – Chapter 2	Emission factor of fuel used in clinker production.
FP_y	TJ	Calculated annually	Plant records	Annual energy of fuel consumed by the clinker production lines

				in year *y*.
$EF_{CO2,fuel,y}$	tCO_2/tonne of fuel	Calculated/ estimated Annually	'India's Initial National Commission- Chapter 2	CO_2 emission factor per unit of energy of the fuel used in year y
$O_{clinker,y}$	Tonne	Measured annually	Plant records and annual reports	The clinker production will be monitored continuously with the help of weighing machines. The values will be available in the Distributed Control System (DCS).
$EI_{P,y}$	TJ/t	Calculated annually		Ex post energy consumption per unit output of clinker for given year, y, in TJ/ton of clinker produced
Coal Consumption	t	Measured annually	Plant record	Coal consumption
$\Delta EI_{P,y}$	TJ/t	Increase in specific energy consumption/tonne of clinker produced, Calculated: $EI_{p,y} = \frac{F_{p,y}}{O_{Clinker,y}}$	Plant records and annual reports	The data will be recorded annually.

4.7.3 Management system and quality assurance

The existing data management, review and audit systems of Birla Corporation Limited already take care of the requirement of cement production. The project participant has developed a monitoring protocol which will be followed during the proposed crediting period to ensure proper operation of the project activity resulting in generation of carbon credits. This includes a range of data measurement, estimation and collection options/techniques in each case indicating preferred options consistent with good practices. Thus it can be expected that the management of the project activity will provide adequate reliability in data monitoring, archiving and performance reviews.

4.8 Estimation of GHG emissions

The emission reduction ER_y by the project activity during the crediting period is the difference between baseline emissions (EB_y), project emissions (PE_y).

$$ER_y = EB_y - PE_y$$

Where, EB_y is the baseline emissions in year *y*, expressed in tCO_2; PE_y is the project emissions due to possible fuel consumption changes in all cement kilns of the BCL works where the proposed project is located, as a result of the project activity in year *y*, expressed in tCO_2.

Baseline emissions: The power generated by the project activity is supplied to the cement production facility of BCL, Chanderia, with no extra power available for delivery to the grid, the baseline emissions will be calculated as:

$$EB_y = EG_{CP,y} \times EF_{Elec,y}$$

Where, $EG_{CP,y}$ is electricity supplied from the project activity to the cement plant (MWh) and $EF_{Elec,,y}$ is the emissions factor of the baseline electricity supply source, expressed as tCO_2/MWh. Since the electricity generated by the project activity would have been generated by a new fossil fuel based power generation source as an extension of existing CPP, in the absence of the project activity, the $EF_{Elec,y}$ is $EF_{\text{Captive},,y}$. is emission factor of the baseline electricity (tCO_2e/MWh).

The baseline emission factor $EF_{\text{Captive},y}$ is estimated as follows:

$$EF_y = EF_{IGS} = [FI_{IGS} \times COEF_{IGS}]$$

Where, FI_{IGS} is the fossil fuel (*i.e.* coal) consumption rate of the identified generation source (IGS) to supply EG_Y, expressed as GJ/MWh, $COEF_{IGS}$ is the emission coefficient of the fuel (*i.e.* coal) used in identified generation source, expressed as tCO_2/per GJ lower heating value.

The EF_{IGS} has been *calculated* at the start of the crediting period and be fixed for the whole crediting period.

The baseline emission estimate /24/ can be replicated using the data and parameter values provided in the PDD /1/ and supporting files submitted for registration. The data sources mentioned have been verified by DNV. The $EF_{\text{Captive},y}$ of 1.150 tCO_2/MWh is fixed *ex-ante* for the entire first crediting period. The calculations for baseline emission factor were verified and found to be correct by DNV /24/.

2) Project emissions: The project emissions (PE_y) are the difference in CO_2 emissions from the use of fossil fuel in the clinker making process where the project is being implemented, before and after the project implementation.

PE_y, is determined as follows-

$$PE_y = (EI_{p,y} - EI_B) \times O_{clinker,y} \times COEF_{fuel,y}$$

Where, EI_B is the pre-project energy consumption per unit output of clinker in TJ/tonne of clinker produced, $EI_{p,y}$ is the *ex-post* energy consumption per unit output of clinker for given year *y*, in TJ/tonne of clinker produced, $COEF_{fuel,y}$ is the carbon coefficient (tCO_2/TJ of input fuel) of the fuel used in the cement works in year *y* to raise the necessary heat for clinker production, and $O_{Clinker,y}$ is the clinker output of the cement works in a given year *y*.

Pre-project energy consumption per unit output of clinker EI_B, 0.0032 TJ/t of clinker produced was verified from the spreadsheet for estimation of baseline energy consumption for clinker production /22/ and the plant records /8/.

The annual emission reductions calculated based on the estimated power generation from the project is 40 026 tCO_2e per annum represents a reasonable estimation using the assumptions given by the project proponent. DNV confirmed that the baseline methodology has been applied correctly to calculate the emission reductions, all assumptions and data used by PP have been listed in the PDD and all values used in the PDD are considered reasonable.

The emissions sources not foreseen by the methodology is unlikely to contribute more than 1% of the estimated emission reductions of the project. The baseline emission estimate can be replicated using the data and parameter values referenced to in the PDD. The data sources mentioned have been verified by DNV. In summary, the emission reduction calculations are complete, transparent and the data accuracy has been verified.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average *ex-ante* estimation of emission reduction conservatively calculated to be 40 026 tCO_2e per year for the selected crediting period.

All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, 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, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.

4.9 Environmental impacts

The project does not require an environmental impact analysis as per the EIA notification of the MoEF. The project is not likely to create any adverse environmental effects. The project complies with environmental regulations in India. Necessary licenses and environmental clearances have been obtained /11//12//13/. The Rajasthan state pollution control board has granted consent to operate to the project /13/.

4.10 Comments by local stakeholders

The stakeholders identified for the project include elected representatives of the administering the local area (Local Nagar Palika), employees of BCL, worker's union and local NGOs. The stakeholders were contacted on a one to one basis and comments were invited on the project activity on 16 July 2008 /15/, /16/. A summary of the comments received have been provided in the PDD /1/. The project did not receive any adverse comments during the stakeholder consultation and hence no mitigating actions were required.

DNV considers the local stakeholder consultation carried out adequately.

4.11 Comments by Parties, stakeholders and NGOs

The PDD of 12 August 2009 was made publicly available on UNFCCC website http://cdm.unfccc.int/Projects/Validation/DB/T8I9BVLXM22CB7HQB7EC8QZID7KGQX/view.html and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 18 September 2009 to 17 October 2009.

No comments were received in the above mentioned period.

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APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory requirements for Clean Development Mechanism (CDM) project activities

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	OK
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	OK
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	OK
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	OK
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	OK
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedures §31b	OK
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK

Requirement	Reference	Conclusion
anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.		
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
For large-scale projects only		
12. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK
About stakeholder involvement		
13. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK
14. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK
Other		
15. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
16. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
17. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK
18. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK

Table 2 Requirements checklist

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A General description of project activity					
A.1 Title of the project activity (VVM para 55-57)					
A.1.1 Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/1/	DR	☒ Clearly identifiable title of the project activity ☒ Version number of the PDD is included ☒ Date of the PDD is included.		OK
A.1.2 Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	☒ Yes *If no, list where the PDD is not in accordance:*		
A.2 Description of the project activity (VVM para 58-64 and VVM para 135 and 136 (a) & (c) for small-scale project activities, as applicable)					
A.2.1 How was the design of the project assessed?	/1/	DR	*What type is the project?* ☒ Project in existing facility or utilizing existing equipment(s) ☒ Project is either a large scale project or a small scale project with emission reductions exceeding 15 000 tCO_2e per year. In this case, a site visit must be performed. ☐ Project is a bundled small scale project, with each project in the bundle with emission reductions not exceeding 15,000 tCO_2e per year. In such case the number of physical site visits may be based on sampling, if the sampling size is appropriately justified through statistical		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				analysis. ☐ The project is an individual small scale project activity with emission reductions not exceeding 15 000 tCO_2e per year. In this case, DOE may not conduct a physical site visit as appropriate. ☐ Greenfield project *How was the design of the project assessed?* ☒ Physical site inspection ☒ Reviewing available designs and feasibility studies *If a physical site inspection is not undertaken, justify why no site visit was undertaken:*		
A.2.2	If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/	DR	Not applicable. The project activity entails installation of 7.5 MW waste heat recovery based power plant at an existing cement plant.		OK
A.2.3	If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year), justify the sampling through a statistical analysis:	/1/	DR	Not applicable. The project activity entails installation of 7.5 MW waste heat recovery based power plant at an existing cement plant. The cement plant site was visited as part of the validation.		OK
A.2.4	Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	/1/	DR	Yes. The project activity entails installation of 7.5 MW waste heat recovery based power plant at an existing cement plant. The system components have been clearly indicated in the PDD.		OK
A.2.5	Does the project activity involve alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/	DR	Yes. In the pre-project scenario, the waste heat content of the gases was released to atmosphere. In the project activity, the gases were passed through waste heat recovery boilers for steam		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				generation before venting and the steam is used for power generation. The differences are detailed in the PDD.		
A.2.6	Does the project design engineering reflect current good practices?	/1/	DR	Yes the project design engineering reflects the current good practices. The WHRB and the turbine generator are sourced from reputed supplier, Dalian East Energy Project Co. Limited, China.		OK
A.2.7	Would the technology result in a significantly better performance than any commonly used technologies in the host country? Is any transfer of technology from any Annex-I Party involved?	/1/	DR	Yes. The waste heat recovery from clinker waste gas will result in better performance than the commonly used technologies in India.		OK
A.3	**Participation requirements (VVM para 51-54, 125-127)**					
A.3.1	Do all participating Parties fulfil the participation requirements as follows:	/1/ /30/	DR	India (host) a) Party has ratified the Kyoto Protocol ☒ Yes ☐ No b) Party has designated a Designated National Authority ☒ Yes ☐ No c) The assigned amount has been determined ☐ Yes ☒ No		OK
A.3.2	Do the letters of approval meet the following requirements?	/1/ /30/	DR	India (host) a) LoA confirms that Party has ratified the Kyoto Protocol ☒ Yes ☐ No b) LoA confirms that participation is voluntary ☒ Yes ☐ No c) The LoA confirms that the project contributes to the sustainable development of the host country? ☒ Yes ☐ No d) The LoA refers to the precise project activity title in the PDD ☒ Yes ☐ No e) The LoA is unconditional with respect to (a) to (d) above ☒ Yes ☐ No		OK

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f) The LoA is issued by the respective Party's DNA g) The LoA was received directly by the DNA or the PP h) In case of doubt regarding the authenticity of the letter of approval, describe how it was verified that the letter of approval is authentic	☒ Yes ☐ No ☐ DNA ☒ PP The approval of the project could be verified from the official CDM web-site of India				
A.3.3 Have all private/public project participants been authorized by an involved Party?	/1/	DR	The Project Participant Birla Corporation Limited has been authorized by the DNA of India.		OK
A.4 Technical description of the project activity (VVM para 58-64)					
A.4.1 Is the project's location clearly defined?	/1/	DR	Yes, the project activity is being implemented by M/s Birla Corporation Limited at the premises of Birla Cement Works and Chanderia Cement Works, located at Chanderia, in the state of Rajasthan in India.		OK
A.5 Public funding of the project activity					
A.5.1 In case public funding from Parties included in Annex I is used for the project activity, have these Parties provided an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties?	/1/	DR	Not applicable. The project does not have any public funding from any Annex I Party.		OK
B Application of a baseline and monitoring methodology					
B.1 Methodology applied (VVM para 65-76 and VVM para 136 (b) for small-scale project activities, as applicable)					
B.1.1 Does the project apply an approved methodology and the correct and valid version thereof?	/1/	DR	Approved consolidated methodology AM0024, version 02.1 has been applied for the project,		OK

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			which was relevant at the time of web hosting.		
B.1.2 If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?	/1/	DR	Not applicable		OK
B.1.3 If the project applies a small-scale methodology, does the project also comply with the general guidelines to SSC CDM methodologies, which provides guidelines on equipment capacity, equipment performance/lifetime, baseline identification for type-II/III Greenfield project activities, sampling and other monitoring-related issues?	/1/	DR	Since the project applies large scale methodology, this is not applicable.		OK
B.2 Applicability of methodology (and tools) (VVM para 65-76) *Insert a row for each applicability criteria of the applied methodology (and tools)*					
B.2.1 How was it validated that project complies with the following applicability criteria**:** This methodology is applicable to project activities that use waste heat gas generated in clinker making process (i.e. in the cement kilns) to produce electricity.	/1/	DR	The project involves generation of electricity from clinker waste heat. This has been verified from the contract for the supply of waste heat recovery system.		OK
B.2.2 How was it validated that project complies with the following applicability criteria: The electricity produced is used within the cement works where the proposed project activity is located and excess electricity is supplied to the grid; it is assumed that there is no electricity export to the grid in the baseline scenario (in case of existing captive power plant	/1/	DR	The entire electricity generated will be used within the industrial facility for captive consumption. The verification of electricity bills shows that BCL imports part of the electricity from the grid, which indicates the there is internal demand for power within the BCL. Further, the CCW plant capacity is being enhanced, entailing additional electricity requirement.		OK
B.2.3 How was it validated that project complies with the following applicability criteria: Electricity generated under the project activity displaces either grid electricity or from an identified specific generation source. Identified specific generation source could be either an existing captive power	/1/	DR	Energy is generated by the project activity will replace the power from an identifiable generation source.		OK

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generation source or new generation source					
B.2.4 How was it validated that project complies with the following applicability criteria: The grid or identified specific generation source option is clearly identifiable	/1/	DR	New power plant based coal is the identified generation source. The methodology permits consideration of new fossil fuel based CPP only if there is increase in demand for the electricity. The Project Participant is requested to justify the selection of new coal based plant as the identifiable generation source.		OK
B.2.5 How was it validated that project complies with the following applicability criteria: Waste heat is only to be used in the project activity	/1/	DR	The waste heat is used in the project activity alone. This has been verified from the contract for supply of boilers.		OK
B.2.6 How was it validated that project complies with the following applicability criteria: In the baseline scenario, the recycling of waste heat is possible only within the boundary of the clinker making process (e.g. clinker production lines in baseline scenario could include some heat recovery systems to capture a portion of the waste heat from the cooler end of the clinker kiln and use this to heat up the incoming raw materials and fuel - so called Type 1 Waste Heat Utilization as described in explanatory note below).Type I Waste Heat Utilization: This is when waste heat is used in the baseline scenario within the energy balance boundary of the clinker making process and which is reflected in the specific fuel consumption of the clinker line per unit output of clinker;	/1/	DR	In the baseline, a part of the waste heat from the gas is captured to preheat the incoming raw materials and fuel (Type 1 activity) and the rest is vented out. This has been verified during the site visit.		OK
B.2.7 How was it validated that project complies with the following applicability criteria: Where the current use of waste heat or the identified alternative business as usual use of waste heat is located outside of the clinker making process (so called Type 2)	/1/	DR	During the site visit, it was verified that no waste recovery facility is located outside the clinker making process.		OK
B.2.8 How was it validated that project complies with the following applicability criteria: That affect process emissions	/1/	DR	The technology supplier Dalian confirmed that the there will be no change in specific energy		OK

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from cement plants.			consumption of clinker. Thus the process emissions will not be impacted. Further, the specific energy consumption will be monitored and any increase from baseline will be accounted as project emissions.		
B.2.9 Is the selected baseline on of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/	DR	Yes. The baseline selected is the installation of new coal based coal based power plant, generating emissions in the absence of the project activity.		OK
B.3 Project boundary (VVM para 78-80)					
B.3.1 What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/	DR	Yes. The project system boundary encompasses the two cement plants – the source of waste heat source, 7 waste heat recovery boilers (WHRBs), one condensing steam turbine generator with auxiliaries and the electrical system dedicated to supply power to the cement plants, coal based captive power plant and the regional power grid. The boundaries have been identified in accordance with the methodology.		OK
B.3.2 Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/1/	DR	The only GHG source identified for the project activity is CO_2. This has been identified in accordance with the methodology.		OK
B.3.3 Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/1/	DR	No. The project activity is generation of electricity by waste heat recovery in the cement plant and so does not involve any other emission source not foreseen by the methodology.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.4 Baseline scenario determination (VVM para 81-88, 105-107) *Ensure that the evaluation of all alternatives provided in the PDD and required by the methodology and also possible alternatives/offshoots of alternatives are discussed. Check that all alternatives required to be considered by the methodology are included in the final PDD. If baseline alternatives required to be considered by the methodology are considered not applicable, please assess the justification for this.*					
B.4.1 Which baseline scenarios have been identified? Is the list of baseline scenarios complete?	/1/	DR	The baseline scenarios identified for the project activity are captive power generated by the new coal based power plant, waste heat power generation without CDM benefits import of power from the local grid and captive power generation based on other fuels. The list of baseline scenarios identified is deemed complete.		OK
B.4.2 How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR	The cost of grid power is the costliest among all the alternatives, thus eliminated. The cost of diesel is very high in India and natural gas is not available at the plant, thus eliminating alternative 4. The project activity without CDM faces investment barriers, as has been detailed under the additionality and is eliminated.		OK
B.4.3 What is the baseline scenario?	/1/	DR	Captive power generated by the new coal based power plant has been selected as the baseline scenario for the project activity.		OK
B.4.4 Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/	DR	Yes. The determination of the baseline scenario is in accordance with the guidance in the methodology.		OK
B.4.5 Has the baseline scenario been determined using	/1/	DR	Yes. The baseline scenario has been determined		OK

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conservative assumptions where possible?			using conservative assumptions where possible.		
B.4.6 Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	Yes, the baseline scenario sufficiently takes into account relevant national and/or sectoral policies.		OK
B.4.7 Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	Yes, the baseline scenario determination is compatible with the available data and all the literature and sources are clearly referenced.		OK
B.4.8 Is the baseline determination adequately documented in the PDD? • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable • Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/	DR	Yes. The baseline determination has been adequately documented in the PDD		OK
B.5 Additionality determination (VVM para 94-121 and VVM para 137 for small-scale project activities, as applicable)					
B.5.1 What approach/tool does the project use to assess additionality? Is this in line with the methodology?	/1/	DR	The tool for demonstration and assessment of additionality version 5.2 has been used. Yes this is in line with the methodology		OK
B.5.2 Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR	Yes the regulatory requirements have been taken into account to evaluate the alternatives to the project activity.		OK

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B.5.3 Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	Yes. The relevant approvals have been provided for verification and this has been verified and found to be in order by DNV.		OK
B.5.4 What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/	DR	The project additionality has been mainly based on investment comparison analysis.		OK
Prior consideration of CDM (VVM para 98-103)	/1/				
B.5.5 What is the evidence for serious consideration of CDM prior to the time of decision to proceed with the project activity?	/1/ /2/ /5/ /9/	DR	CDM was seriously considered in the decision to proceed with the project activity in compliance with EB41 annex 46, which was confirmed through: • Early consideration of CDM is evidenced by Board of Directors resolution of BCL, dated 31 January 2008, in which the CDM benefits were considered prior to the start date of the of the project which is 28 May 2008. • BCL has appointed M/s Ernst & Young as consultants for the CDM project on 3 March 2008. • BCL signed the agreement with M/s Dalian for the WHRB and turbo generator on 28 May 2008, which is the project start date.		OK
B.5.6 If the starting date is after 2 August 2008 and before the global stakeholder consultation, has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM status?	/1/	DR	Not applicable. The start date of the project activity is 28 May 2008.		OK
Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)					
B.5.7 What initiatives where taken by the project participants from the starting date of the project activity to	/1/	DR	The assessment that continuing and real actions		OK

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the start of validation in parallel with the physical implementation of the project activity?	/15/ /16/ /17/ /18/		were taken to secure CDM status for the project in parallel with its implementation is summarized below: • BCL invited stake holder comments by sending letters on 16 July 2008. • The stake holder responses were received on 23 July 2008. • Communication from DNA of India regarding project presentation dated 8 May 2009. • Project presentation to DNA of India on 14 May 2009. • Appointment of DoE for validation of the project on 21 July 2009. • Web hosting of PDD for global stakeholder consultation on 18 September 2009.		
B.5.8 When did the construction of the project activity start?	/1/ /27/	DR	The construction activities started on 27 August 2009 with the awarding of work order to Ahluvalia Erectors for fabrication of steel structurals.		OK
B.5.9 When was the project commissioned?	/1/	DR	The project is yet to be commissioned.		OK
B.5.10Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/1/	DR	It has been evidenced from the chronology of events that the time gap between two events for securing CDM status for the project activity is less than two years which implies the continuous procedures towards securing CDM status and demonstrates sufficient efforts to secure CDM status in parallel with the implementation.		OK

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Investment analysis (VVM para 108-114) *The list of questions below must be adjusted to the parameters in the investment analysis relevant to the project under validation.*					
B.5.11Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/1/	DR	Yes. The project activity generates power for captive consumption and thus generates revenue. The same is also mentioned in the PDD.		OK
B.5.12Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR	Yes. The alternative to the project activity does require investment and this is indicated in the PDD.		OK
B.5.13Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	Yes. The investment comparison analysis has been chosen by PP to demonstrate the additionality of the project and is deemed to be correct.		OK
B.5.14Is the benchmark/discount rate the latest available at the time of decision?	/1/	DR	Not applicable. Investment analysis has been demonstrated by means of investment comparison analysis.		OK
B.5.15What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/	DR	The financial indicator selected by the PP for the investment analysis is the post tax project IRR.		OK
B.5.16Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/1/	DR	The waste heat from the exhaust gases were vented to the atmosphere in the baseline. Since the waste heat vented in the baseline is not a saleable commodity, it is considered to have zero value.		OK
B.5.17Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/1/	DR	Yes. Income tax calculation considers depreciation as permissible under the income tax act. The depreciation considered is as per the accounting practice allowable for such type of projects as per the Income tax act.		OK
B.5.18Is the time period of the investment analysis and	/1/	DR	The 20 years time period of investment analysis		OK

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operating time of the project realistic? Has salvage value been taken into account? Is working capital returned in the last year of operation?			and the operating lifetime of the project is same and realistic. Salvage value has been added back during the 20th year. The working capital has not been considered in the financial analysis.		
B.5.19When a feasibility study report or similar approved by the government is used as the basis for the investment analysis: Can it be confirmed that the values used in the PDD are fully consistent with the FSR and is the period of time between finalization of the FSR and the investment decision adequate?	/1/	DR	Not applicable. No FSR for the project was available.		OK
B.5.20How was the amount of output (e.g. sales of electricity) assessed? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /3/	DR	☐ The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval ☒ The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) ☐ Other approach. The PLF was validated from the technical offer for the project submitted by Dalian.		OK
B.5.21How was the output price (e.g. electricity price) assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /6/ /19/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants The electricity cost of grid power was verified from the monthly invoice and the cost of captive power verified from the cost sheet of captive power plant.		OK
B.5.22How were the investment costs assessed? Were the	/1/ /27/	DR	☒ Cross-check against third-party or publicly		OK

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data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.			available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements, contracts and annual financial reports related to the project and the project participants The investment costs were verified from the purchase orders placed for the equipment and other items.		
B.5.23How were the O&M costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants O&M costs of the project were verified from the Board note and that of new coal based CPP was verified from the cost sheet of captive power plant.		OK
B.5.24Describe the assessment of the other input parameters. Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants The cost of baseline plant and PLF was verified from the offer from Cethar Vessels, cost of coal from the Board note, escalation in tariff and O&M cost from the yearly whole sale price index, debt-equity ratio, interest on term loan from the Board note and the depreciation and tax rates from the Income Tax Act.		OK
B.5.25Was the financial calculation spreadsheet verified and found to be correct?	/1/	DR	The financial calculation spreadsheet was verified and apparently found to be correct.		OK

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B.5.26Sensitivity analysis: Have the key parameters contributing to more than 20% of the revenue/costs during operating or implementation been identified? Has possible correlation between the parameters been considered?	/1/	DR	The sensitivity analysis has been done to analyse the effect of ± 10% variation in project cost, coal price, grid power tariff, O&M costs and power generation from waste gas, contributing to more than 20% of the revenue/costs. No correlation was found on the outcome of the financial analysis due to the variation of the parameters.		OK
B.5.27Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/	DR	Yes. The range of variations is reasonable in the project context.		OK
B.5.28Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/1/	DR	Yes. Sensitivity analysis has also been done to determine at what point of variation of key parameters the project IRR crosses the baseline IRR and justified why it is unlikely to happen.		OK
Barrier analysis (VVM para 115-118)					
B.5.29Are the barriers identified complimentary to a potential investment analysis? Does the barrier have a clear impact on the financial returns so that it can be assessed in an investment analysis? Each barrier is discussed separately.	/1/	DR	PP has not identified other barriers for the project activity.		OK
B.5.30How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR	PP has not identified investment barriers for the project activity.		OK
B.5.31How does CDM alleviate the investment barriers?	/1/	DR	PP has not identified investment barriers for the project activity.		OK
B.5.32Is the project activity prevented by the investment barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	Not Applicable.		OK
B.5.33How were the technological barriers assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/	DR	PP has not identified technological barriers for the project activity.		OK
B.5.34How does CDM alleviate the technological barriers?	/1/	DR	Not Applicable.		OK
B.5.35Is the project activity prevented by the technological	/1/	DR	Not Applicable.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?					
B.5.36How were the barriers due to prevailing practise assessed to be real? Are the barriers due to prevailing practise substantiated by a source independent of the project participants?	/1/	DR	Not Applicable.		OK
B.5.37How does CDM alleviate the barriers due to prevailing practise?	/1/	DR	Not Applicable.		OK
B.5.38Is the project activity prevented by the barriers due to prevailing practise and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	Not Applicable.		OK
B.5.39How were the other barriers assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/1/	DR	Not Applicable.		OK
B.5.40How does CDM alleviate the other barriers?	/1/	DR	Not Applicable.		OK
B.5.41Is the project activity prevented by the other barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	Not Applicable.		OK
Common practice analysis (VVM para 119-121)					
B.5.42What is the geographical scope of the common practice analysis? Is this justified?	/1/	DR	Geographical scope identified for the common practice analysis is the cement plants in India and is deemed appropriate.		OK
B.5.43What is the scope of technology and size (e.g. capacity of power plant) for the common practice analysis and how has this been justified?	/1/	DR	The scope of technology selected is the installation of waste heat recovery based power generation by utilising the waste heat emanating from the gas of clinker cooler and the pre-heater. The scope does not limit the size of the plant.		OK
B.5.44What is the data source(s) used for the common practice analysis?	/1/	DR	The data sources used for the common practice analysis are CDM Pipeline database, UNFCCC CDM web site and the Cement Manufacturer's		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Association. Technical Committee meeting, agenda for the 45th meeting.		
B.5.45How many similar non-CDM-projects exist in the region within the scope?	/1/	DR	No non-CDM-projects within the scope were stated to exist in the region.		OK
B.5.46How were possible essential distinctions between the project activity and similar activities assessed?	/1/	DR	All the projects within the identified scope are being implemented with CDM consideration.		OK
B.5.47What is the conclusion of the common practice analysis?	/1/	DR	The analysis concluded that the project activity is not a common practice in the region.		OK
Conclusion					
B.5.48What is the conclusion with regard to the additionality of the project activity?	/1/	DR	The analysis concluded that the project activity is additional.		OK
B.6 Calculations of GHG emission reductions					
Data and parameters that are available at validation and that are not monitored (VVM para 199-203)					
B.6.1 How was the **n**et calorific value per mass unit of the fuel consumed by the clinker production lines **(**$NCV_{fuel,y}$**)** verified?	/1/ /21/	DR	The net calorific value of coal was verified from the coal analysis report.		OK
B.6.2 How was the average annual energy consumption of clinker making process **(**F_B**)** verified?	/1/ /22/	DR	The average annual energy consumption of clinker making process was verified from Spread sheet for estimation of electricity consumption of BCL.		OK
B.6.3 How was the average annual energy consumption of clinker making process **(**F_B**)** verified?	/1/ /22/	DR	The average annual energy consumption of clinker making process was verified from Spread sheet for estimation of electricity consumption of BCL.		OK
B.6.4 How was the **e**mission coefficient of the fuel ($COEF_{IGS}$**)** verified?	/1/ /40/	DR	The **e**mission coefficient of the fuel was verified from he India's initial National Communication.		OK
B.6.5 How was the net electricity generation of the existing captive generation plant ($EG_{ATEXIST}$) verified?	/1/ /22/	DR	The net electricity generation of the existing captive generation plant was verified from Spread sheet for estimation of electricity consumption of		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			BCL.		
B.6.6 How was the electricity consumption of cement works (E_{CEMENT}) verified?	/1/ /22/	DR	The electricity consumption of cement works was verified from Spread sheet for estimation of electricity consumption of BCL.		OK
B.6.7 How was the electricity consumption of other load in the cement works (E_{LOAD}) verified?	/1/ /22/	DR	The electricity consumption of other load in the cement works was verified from Spread sheet for estimation of electricity consumption of BCL.		OK
B.6.8 How was the fossil fuel (*i.e.* coal) consumption rate of the identified generation source (FI_{IGS}) verified?	/1/ /10/	DR	The fossil fuel (*i.e.* coal) consumption rate of the identified generation source was verified from offer for the new coal fired boiler.		OK
Baseline emissions (VVM para 89-93)					
B.6.9 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Yes. The monitoring methodology selected complies with requirements of AM0024 version 02.1. In the baseline scenario, power equivalent to the net power generated in the project activity would have been generated by the new coal fired captive power plant of the project participant. The baseline emission has been calculated as the product of the electricity generated from project activity, efficiency of the plant and the emission factor of the coal based captive power.		OK
B.6.10Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Yes		OK
B.6.11Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Yes		OK
Project emissions (VVM para 89-93)					
B.6.12Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Yes		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.6.13Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Yes		OK
B.6.14Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Yes		OK
Leakage (VVM para 89-93)					
B.6.15Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	The potential leakage due to construction and fuel handling is negligible and can be ignored. This is in line with the methodology.		OK
B.6.16Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	Yes		OK
B.6.17Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	Yes		OK
Emission Reductions (VVM para 89-93)	/1/				
B.6.18Algorithms and/or formulae used to determine emission reductions: • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.	/1/	DR	The Algorithms and/or formulae used to determine emission reductions are in line with the methodology.		OK
B.7 Monitoring plan (VVM para 122-124)					
Data and parameters monitored					
B.7.1 Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/	DR	Yes		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.7.2 Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	Yes		OK
B.7.3 In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR	Yes. The parameters monitored are quantity of electricity supplied to cement plant from the project activity, calorific value of fuel (coal) used in clinker production, emission factor of fuel used in clinker production, annual energy of fuel consumed by the clinker production lines in year *y*, CO_2 emission factor per unit of energy of the fuel used in year y and the annual production of clinker after implementation of project.		OK
B.7.4 In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	Yes. The measurement accuracy is to be stated to be as per national or sectoral standard.		OK
B.7.5 In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/1/	DR	Yes. The instruments used for monitoring are stated to be calibrated once in a year.		OK
B.7.6 Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Yes.		OK
B.7.7 Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Yes. The electricity supplied to the plant is stated to be recorded once in a month. The other parameters will be recorded annually.		OK
Ability of project participants to implement monitoring plan					
B.7.8 How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR	The monitoring arrangements detailed in the PDD are executable.		OK
B.7.9 Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/1/		Yes. The operation and maintenance of the project activity has been detailed in Annex 4 of the PDD.		OK

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B.7.10Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/1/	DR	Yes. The systems and procedures detailed are adequate to ensure the verification of emissions reductions from the project activity.		OK
B.7.11Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR	It is stated that all monitored data required for verification and issuance will be kept for two years after the end of the crediting period.		OK
Monitoring of sustainable development indicators/ environmental impacts					
B.7.12Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR	The DNA of India mandates spending 2% of revenues from the sale of CERs for sustainable development of the local area.		OK
B.7.13Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	The PDD broadly describes how the PP proposes to spend the money for sustainable development. However, it is not included in the monitoring plan.		OK
B.7.14Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR	The Letter of approval from the DNA of India confirms that the project contributes to sustainable development of India.		OK
C Duration of the project activity / crediting period					
C.1.1 Start date of project activity (VVM para 99-100, 104)					
C.1.2 How has the starting date of the project activity been determined? What are the dates of the first contracts for the project activity? When was the first construction activity?	/1/	DR	The start date of the project activity is stated to be 28 May 2008, which is the date of agreement with Dalian for supply of WHRB and turbo generators.		OK
C.1.3 Is the stated expected operational lifetime of the	/1/	DR	Operational lifetime of the project has been		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
project activity reasonable?	/29/		mentioned as 25 years which is reasonable for similar projects.		
C.1.4 Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR	The start date of the crediting period is 1 April 2011 or registration date whichever is later. PP has opted for a fixed crediting period of 10 years duration.		OK
D Environmental Impacts (VVM para 131-133 and VVM para 136 (d) for small-scale project activities, as applicable)					
D.1.1 Are there any host country requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved? Does the approval contain any conditions that need monitoring?	/1/ /11/ /12/ /13/	DR	Indian legislation in vogue does not warrant an EIA to be done for this type of project activity. However, PP has obtained necessary approvals from the Rajasthan State Pollution Control Board for setting up the project activity.		OK
D.1.2 Does the project comply with environmental legislation in the host country?	/1/ /11/ /15/ /16/	DR	Indian legislation in vogue does not warrant an EIA to be done for this type of project activity. However, PP has obtained necessary approvals from the Rajasthan State Pollution Control Board for setting up the project activity.		OK
D.1.3 Will the project create any adverse environmental effects?	/1/	DR	There are no negative environmental impacts due to the project activity.		OK
D.1.4 Have identified environmental impacts been addressed in the project design?	/1/	DR	No negative impact has been identified.		OK
D.1.5 Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/	DR	No negative impact has been identified.		OK
D.1.6 Are transboundary environmental impacts considered in the analysis?	/1/		The project being a waste heat recovery project, transboundary environmental impacts are unlikely.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
E Stakeholder Comments (VVM para 128-130)						
E.1.1	Have relevant stakeholders been consulted?	/1/ /15/ /16/	DR	Local stakeholders were consulted by seeking comments on the project activity, by sending out letters dated 12 January 2005.		OK
E.1.2	Have appropriate media been used to invite comments by local stakeholders?	/1/ /15/ /16/	DR	Letters dated 12 January 2005 were sent to the selected local stakeholders inviting comments on the project activity.		OK
E.1.3	If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/ /15/ /16/	DR	Stakeholder consultation is not mandated by the Indian DNA.		OK
E.1.4	Is a summary of the stakeholder comments received provided?	/1/ /15/ /16/	DR	A summary of the stakeholder comments received provided in the PDD.		OK
E.1.5	Has due account been taken of any stakeholder comments received?	/1/ /15/ /16/	DR	No adverse comments have been received		OK

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APPENDIX B

ORIGINAL CDM VALIDATION PROTOCOL

A General Description of Project Activity *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/1/	DR	Yes, the project activity is being implemented by M/s Birla Corporation Limited at the premises of Birla Cement Works and Chanderia Cement Works, located at Chanderia, in the state of Rajasthan in India.		OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1/	DR/I	Yes. The project system boundary encompasses the cement plants, 7 waste heat recovery boilers (WHRBs), one condensing steam turbine generator with auxiliaries and the electrical system dedicated to supply power to the cement plants. However the PP is requested to include the waste heat gas sources, captive power plant and the local grid also in the project boundary, in line with the methodology. schematic diagram of the project activity is to be included in the PDD and the capacities of the kiln clearly stated.	~~CL 1~~	OK
A.2. Participation Requirements *Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project*					

Participant.					
A.2.1. Which Parties and project participants are participating in the project?	/1/ /6/	DR/I	The private entity Birla Corporation Limited of India is the only participant for the project. During the site visit, it was observed that Chanderia complex of BCL consists of two cement plants under the entities Birla Cement Works and Chanderia Cement Works and the Captive power plant under Chanderia Power. It is also seen that the order for the project activity is placed by Birla Corporation Limited. The Project Participant is requested to detail in the PDD the arrangement between the different entities with respect to the project activity and CERs. PP is also requested to provide copy of the agreement between the entities for the project activity.	~~CAR 1~~	OK
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/ /30/	DR/I	Host Country Approval letter needs to be provided for verification. The voluntary participation of the project needs to be confirmed against the letter of approval from the DNA	~~CAR 2~~	OK
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/ /30/	DR	The Ministry of Environment and Forests (MoEF) is the DNA of India. India ratified the Kyoto Protocol on 26 August 2002. The host party India has confirmed their voluntary participation. Host Country Approval letter needs to be provided for verification. The voluntary participation of the project needs to be	~~CAR 2~~	OK

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			confirmed against the letter of approval from the DNA		
A.2.4. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/1/	DR/I	The project does not have any public funding from any Annex I Party		OK
A.3. Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
A.3.1. Does the project design engineering reflect current good practices?	/1/	DR/I	Yes the project design engineering reflects the current good practices. The WHRB and the turbine generator are of sourced from reputed supplier, Dalian East Energy Project Co. Limited, China.		OK
A.3.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/1/	DR/I	Yes. The waste heat recovery from clinker waste gas will result in better performance than the commonly used technologies in India.		OK
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1/ /3/	DR/I	The project proponent is requested to provide the training and maintenance schedule of the WHRBs and turbine generators.	~~CL 2~~	OK
A.4. Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/1/	DR/I	Host Country Approval letter needs to be provided for verification. The voluntary	~~CAR 2~~	OK

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	/30/		participation of the project needs to be confirmed against the letter of approval from the DNA		
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR/I	The PP will spent 2% of the revenues generated from the sale of CERs from the project activity for the local community, as per the requirement of the local DNA. Further, the project project will also create job opportunity during construction as well as normal operation phase.		OK
B Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/	DR	Approved consolidated methodology AM0024, version 02.1 has been applied for the project, which was relevant at the time of web hosting.		OK
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/ /5/ /6/ /19/ /25/	DR	The methodology is applicable to the project activity since: ➢ The project involves generation of electricity from clinker waste heat. This has been verified from the contract for the supply of waste heat recovery system.		

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			➢ The entire electricity generated will be used within the industrial facility for captive consumption. The verification of electricity bills shows that BCL imports part of the electricity from the grid, which indicates the there is internal demand for power within the BCL. ➢ Energy is generated by the project activity will replace the power from an identifiable generation source. ➢ New power plant based coal is the identified generation source. The methodology permits consideration of new fossil fuel based CPP only if there is increase in demand for the electricity. The Project Participant is requested to justify the selection of new coal based plant as the identifiable generation source. ➢ The waste heat is used in the project activity alone. This has been verified from the contract for supply of boilers. ➢ In the baseline, a part of the waste heat from the gas is captured to preheat the incoming raw materials and fuel (Type 1 activity) and the rest is vented out. This has been verified during the site visit.	~~CAR 3~~	OK

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B.2. Baseline Scenario Determination *The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.*					
B.2.1. What is the baseline scenario?	/1/ /5/ /7/ /19/ /22/ /25/ /40/	DR/I	Captive power generated by the new coal based power plant has been selected as the baseline scenario for the project activity. The methodology requires identification of the current electricity supply and demand baseline from the electricity demand of the cement works, other local loads and the baseline generation from the existing CPP(E_{CEMENT}, E_{LOAD} and $EG_{ATEXIST}$) using the data of at least the two years prior to the start date of the project. However in PDD, these parameters are not derived as per the requirement of methodology. The project participant is requested to provide spreadsheet for the calculation of E_{CEMENT}, E_{LOAD} and $EG_{ATEXIST}$ along with the supporting data. The methodology permits consideration of new fossil fuel based CPP only if there is increase in demand for the electricity. The Project Participant is requested to justify the selection of new coal based plant as the identifiable generation source.	~~CAR 4~~ ~~CAR 3~~	OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the	/1/	DR/I	Other than the selected baseline the project		

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most likely one?	/19/ /25/		proponent has also considered the following alternatives described in the methodology: **Waste Heat utilisation:** ➢ Use of waste heat for uses other than the present is not feasible because of the low temperature and high dust content. **Additional power generation:** ➢ Proposed project activity not under taken as a CDM project activity. ➢ Continued import of power from the local grid Both the alternatives comply with the local regulations. The methodology permits consideration of new fossil fuel based CPP only if there is increase in demand for the electricity. The Project Participant is requested to justify the selection of new coal based plant as the identifiable generation source.	~~CAR 3~~	OK
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/ /5/ /7/ /19/ /22/ /25/ /40/	DR	Please refer to B.2.1	~~CAR 3~~ ~~CAR 4~~	OK

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B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/ /5/ /7/ /19/ /22/ /25/ /40/	DR/I	Please refer to B.2.1	~~CAR 3~~ ~~CAR 4~~	OK
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR/I	Yes, the baseline scenario sufficiently takes into account relevant national and/or sectoral policies.		OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/ /5/ /7/ /19/ /22/ /25/ /40/	DR/I	Please refer to B.2.1	~~CAR 3~~ ~~CAR 4~~	OK
B.2.7. Have the major risks to the baseline been identified?	/1/	DR/I	There are no risks to the identified baseline.		OK
B.3. Additionality Determination *The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.*					
B.3.1. Is the project additionality assessed according to the methodology?	/1/ /2/	DR/I	The project's additionality is demonstrated using "Tool for the demonstration and assessment of additionality", version 5.2.		

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	/3/ /5/ /10/ /19/ /20/ /24/ /25/ /28/ /39/ /41/		**Step 1:** Three alternatives to the project activity have been considered as the baseline scenario. These are 1. The proposed project is undertaken without CDM benefits. 2. Captive Power generation based on a new coal based power plant. 3. Existing scenario of continuing to import power from the local grid All the alternatives are in compliance with the laws and regulations of India. **Step 2:** Among the two options *i.e.* 'Option-II: Investment comparison analysis' and 'Option-III: Benchmark analysis', the project proponent has adopted the investment comparison analysis. The levelised cost of electricity generation has been used as the financial indicator for the investment comparison analysis. However the project participant is requested to clarify the following points regarding the levelised cost analysis: ▪ Supporting documents for all the input parameters used ▪ The requirement of power import from the grid in the project scenario needs to be justified considering the average import during the past 3 years will be		

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			more than offset by the generation from the WHR based power. ▪ The reasons for estimating very low PLF for the WHR based power plant needs to be substantiated. ▪ The discrepancy in capacity of the new CPP needs to be clarified. In the spreadsheet it is stated to be 8 MW at one place and 7.3 MW at the other place. ▪ Basis for calorific value and price of coal ▪ The details of project and baseline investment cost ▪ Details of import of power from the grid for the past 2 years and its cost ▪ Basis for using station heating rate of 2867 kcal/kWh needs to be substantiated ▪ Basis for the auxiliary power consumption, O&M costs and interest rate on loan	~~CL 3~~	OK
			In line with the applicable methodology AM0024 version 02.1; the option with the highest IRR is the baseline scenario for waste heat recovery and electricity supply to the cement works. Thus the PP is requested to do the IRR analysis instead of levelised cost analysis.	~~CAR 5~~	OK
			The project proponent is requested to do the sensitivity analysis for variations in investment cost and maintenance cost also	~~CL 4~~	OK

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			after doing IRR analysis of the project activity and substantiate why this variation is not possible. **Step 4:** In the state of Rajastan, WHRB CPP is not a common practice in cement manufacturing units. At present, the WHRU is installed only in 2 out of the 15 cement plants in India, both of which have considered CDM benefits. However, the Project Participant is requested to justify the selection of the region, scale and technology used for the demonstration of common practice analysis. Further, supporting documents needs to be provided for the data used.	~~CL 5~~	OK
B.3.2.	Are all assumptions stated in a transparent and conservative manner?	/1/	DR/I	Please refer to B.3.1	~~CL 3~~ ~~CL 4~~ ~~CL 5~~ ~~CAR 5~~	OK
B.3.3.	Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR/I	Please refer to B.3.1	~~CL 3~~ ~~CL 4~~ ~~CL 5~~ ~~CAR 5~~	OK
B.3.4.	If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/1/ /2/	DR/I	The Project Proponent has selected 28 May 2008 as the start date of the project activity, which is the date of signing of contract for supply of waste heat recovery system.		

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			Since the start date is prior to the date of web hosting, Project Proponent is requested to demonstrate that the CDM was seriously considered in the decision to implement the project activity.	~~CL 6~~	OK
			Project Proponent is also requested to provide chronology of events under section B.5 of the PDD and demonstrate the continued real action to secure the CDM along with project implementation.	~~CL 7~~	OK
B.4. Calculation of GHG Emission Reductions – Project emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR/I	The calculations are documented as per the applicable methodology AM0024 version 2.1.		OK
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/1/	DR/I	The change in energy consumption/ton clinker needs to be monitored and considered in the calculation of project emissions. However, it is stated that there would not be any change in specific energy consumption for per ton of clinker production after the implementation of the proposed project activity and is taken as zero. The Project Proponent is requested to document energy	~~CAR 6~~	OK

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			consumption in TJ/ton in the baseline ex-ante, as per the methodology.		
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/1/	DR/I	Refer to B.4.2	~~CAR 6~~	OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions *It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /19/ /24/ /25/ /32/	DR/I	The baseline emissions have been calculated as per the approved consolidated methodology AM0024 version 02.1. In the baseline scenario, power equivalent to the net power generated in the project activity would have been generated by the new coal fired captive power plant of the project participant. The baseline emission has been calculated as the product of the electricity generated from WHRB, efficiency of the plant and the emission factor of the coal based captive power. However the Project Participant is requested to justify the selection of new coal based plant as the identifiable generation source. IPCC default value for carbon coefficient of fuel is used though national values are available for coal. Thus project proponent is requested to consider the national value for	~~CAR 3~~ ~~CAR 7~~	OK

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			carbon coefficient of fuel.		
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/ /10/	DR/I	Project proponent has used 30% efficiency for the baseline plant. The supporting documents for the same needs to be provided.	~~CL 8~~	OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/ /10/	DR/I	Refer to B.5.2	~~CL 8~~	OK
B.6. Calculation of GHG Emission Reductions – Leakage *It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /32/	DR	The potential leakage due to construction and fuel handling is negligible and can be ignored which is in line with the applicable methodology AM0024 version 02.1.		OK
B.7. Emission Reductions *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.*					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1/	DR/I	The project will result in emission reductions over the baseline. Actual emission reduction will be inserted in the final validation report.		OK
B.8. Monitoring Methodology *It is assessed whether the project applies an appropriate monitoring methodology.*					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and	/1/	DR/I	The monitoring methodology selected complies with requirements of AM0024		

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transparent manner?	/32/		version 02.1. The PP is requested to update the monitoring plan by including all the parameters required by the monitoring methodology such as calorific value of fuel, oxidation factor etc.	~~CAR 8~~	OK
B.8.2. Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR/I	The monitored data will be retained and preserved for up to 2 years after the crediting period. Records will be maintained in electronic and/or paper media.		OK
B.9. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/	DR/I	It is stated that there would not be any change in specific energy consumption for per ton of clinker production after the implementation of the proposed project activity and is taken as zero. The change in energy consumption/ton clinker needs to be monitored and considered in the calculation of project emissions. However, it is stated that there would not be any change in specific energy consumption for per ton of clinker production after the implementation of the proposed project activity and is taken as zero. The Project Proponent is requested to document energy consumption in TJ/ton in the baseline ex-ante, as per the methodology.	~~CAR 6~~	OK

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			The Project Participant is requested to clarify how the auxiliary consumption of the WHRU is accounted and whether there will be additional power consumption due to the project activity in areas such as gas cleaning.	~~CL 9~~	OK
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/1/	DR/I	CO_2 is the only project GHG indicator and the same has been accounted for.		OK
B.9.3. Is the measurement method clearly stated for each GHG value to be monitored and deemed appropriate?	/1/ /3/	DR/I	Please refer to B.9.1	~~CAR 6~~ ~~CL 9~~	OK
B.9.4. Is the measurement equipment described and deemed appropriate?	/1/ /3/	DR/I	Please refer to B.9.1	~~CAR 6~~ ~~CL 9~~	OK
B.9.5. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/ /3/	DR/I	Please refer to B.9.1	~~CAR 6~~ ~~CL 9~~	OK
B.9.6. Is the measurement *interval* identified and deemed appropriate?	/1/ /3/	DR/I	Please refer to B.9.1	~~CAR 6~~ ~~CL 9~~	OK
B.9.7. Is the *registration, monitoring, measurement* and *reporting* procedure defined?	/1/ /3/	DR/I	Please refer to B.9.1	~~CAR 6~~ ~~CL 9~~	OK
B.9.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/ /3/	DR/I	Please refer to B.9.1	~~CAR 6~~ ~~CL 9~~	OK
B.9.9. Are procedures identified for day-to-day records handling (including what records to keep, storage	/1/ /3/	DR/I	Please refer to B.9.1	~~CAR 6~~ ~~CL 9~~	OK

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area of records and how to process performance documentation)					
B.10. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete baseline emission data over time.*					
B.10.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR/I	Yes. The monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions.		OK
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR/I	CO_2 is the only baseline GHG indicator and the same has been accounted for.		OK
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/	DR/I	Yes		OK
B.10.4. Is the measurement *equipment* described and deemed appropriate?	/1/	DR/I	Yes		OK
B.10.5. Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR/I	The project proponent is requested to provide the accuracy of the monitoring equipment, measurement interval of the baseline data and the calibration interval of the instruments in the PDD.	~~**CL 10**~~	OK
B.10.6. Is the measurement *interval* for baseline data identified and deemed appropriate?	/1/	DR/I	Please refer B.10.5	~~CL 10~~	OK
B.10.7. Is the registration, *monitoring, measurement* and *reporting* procedure defined?	/1/	DR/I	Please refer B.10.5	~~CL 10~~	OK

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B.10.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR/I	Please refer B.10.5	~~CL 10~~	OK
B.10.9. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR/I	Please refer B.10.5	~~CL 10~~	OK
B.11. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR/I	The potential leakage due to construction and fuel handling is negligible and can be ignored.		OK
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR/I	The DNA of India mandates spending 2% of revenues from the sale of CERs for sustainable development of the local area.		OK
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR/I	The PDD broadly describes how the PP proposes to spend the money for sustainable development. However, it is not included in the monitoring plan.	~~**CAR 9**~~	OK
B.12.3. Are the sustainable development indicators in line	/1/	DR/I	Please refer to B.12.2	~~CAR 9~~	OK

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with stated national priorities in the Host Country?					
B.13. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1/	DR/I	Yes the authority and responsibility of overall project management has been described clearly.		OK
B.13.2. Are procedures identified for training of monitoring personnel?	/1/	DR/I	Yes, procedures for training of monitoring personnel have been identified.		OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR/I	There are no emergencies which might lead to unintended emissions.		OK
B.13.4. Are procedures identified for review of reported results/data?	/1/	DR/I	Yes procedures for review and internal audits have been identified.		OK
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR/I	Please refer to B.13.1		OK
C Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
A. Are the project's starting date and operational lifetime clearly defined and evidenced?	/1/	DR/I	The project proponent has selected 1 April 2010 or date of registration, whichever is		OK

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			later as the start date of the crediting period. The lifetime of the project is stated to be 20 years which is reasonable for such projects.		
B. Is the start of the crediting period clearly defined and reasonable?	/1/	DR	The start date of crediting period has been fixed as 1 April 2010 which is tentative date of commissioning or on registration with UNFCCC whichever is later		OK
D Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
D.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/ /12// 13/	DR/I	Yes, the environmental impacts of the project activity have been described adequately.		OK
D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/ /12/	DR/I	The EIA for the project not required as per the Host Party legislation.		OK
D.1.3. Will the project create any adverse environmental effects?	/1/	DR/I	There are no negative environmental impacts due to the project activity.		OK
D.1.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR/I	The project being a waste heat recovery project, transboundary environmental impacts are unlikely.		OK
D.1.5. Have identified environmental impacts been addressed in the project design?	/1/	DR/I	No environmental impacts due to the project activity have been identified.		OK
D.1.6. Does the project comply with environmental	/1/	DR/I	Yes. The clearance for the project from the		OK

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legislation in the host country?	/10/		local Pollution control board has been provided for verification.		
E Stakeholder Comments *The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.*					
E.1.1. Have relevant stakeholders been consulted?	/1/ /15/ /16/	DR/I	Local stakeholders were consulted by seeking comments on the project activity, by sending out letters dated 12 January 2005.		OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR/I	Letters dated 12 January 2005 were sent to the selected local stakeholders inviting comments on the project activity.		OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR/I	Stakeholder consultation is not mandated by the Indian DNA.		OK
E.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR/I	A summary of the stakeholder comments received provided in the PDD.		OK
E.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR/I	The stakeholders have generally appreciated the BCL's initiative in taking up the CDM project.		OK

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Table 2b: Additional requirements checklist for VVM version 1 (EB 44)

Checklist question	Ref	MoV	Comments	Draft Concl.	Final Concl.
A. Letter of approval	§49				
A.1. Is the LoA received directly from the DNA or through the project participant.	/1/	DR/I	Host Country Approval letter needs to be provided for verification. The voluntary participation of the project needs to be confirmed against the letter of approval from the DNA	~~CAR 2~~	OK
B. Project design	§64				
B.1. Does the PDD describe the CDM project activity with all relevant elements in a transparent and accurate way?	/1/	DR/I	Yes		OK
B.2. Has the CDM project activity at the start of the validation been constructed or does the CDM project activity use existing facilities or equipment?	/1/	DR/I	The project activity has been constructed before the start of the validation.		OK
B.3. Is the project a large scale project, a small scale project with average annual emission reductions above 15 000 tonnes or a bundled small scale project? Has on-site visit been carried out?	/1/	DR/I	The project is a large scale project. On site visit has been carried out on 9 October 2009.		OK
B.4. Does the project activity involved alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/	DR/I	The project does not involve any alteration of existing installations.		OK
C. Project emissions not addressed by the methodology	§76				
C.1. Does the methodology describe all project	/1/	DR/I	Yes. The methodology AM0024 ver 02.1		OK

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emission source for the project activity that contributes all 1% of the emission reductions? Sources that the methodology considers not to take into account are not relevant (e.g. cement and iron consumption for building hydropower plants).			describes the calculation of project emissions from the difference in the specific consumption of energy per MT of clinker production before and after the implementation of project activity.		
D. Documentation of baseline emissions	§86				
D.1. Documentation of the baseline determination: • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable • Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/	DR/I	Baseline determination has been done properly with reasonable data. All assumptions and data used by the project participants are listed in the PDD and all the data are properly referenced. All documentation is relevant as well as correctly quoted and interpreted. Project has got clearance from state pollution control board. The methodology has been correctly applied to identify what would occur in the absence of the proposed CDM project activity.		OK
E. Documentation of the calculations	§91				
E.1. Algorithms and/or formulae used to determine emission reductions **E.2.** All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced **E.3.** All documentation is correctly quoted and interpreted. **E.4.** All values used can be deemed reasonable in the context of the project activity	/1/	DR/I	Formulae used to determine emission reductions has been sourced correctly from the methodology AM0024 ver 02.1. All assumptions and reasonable data used by the project participants are listed in the PDD and all the data are properly referenced.		OK

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E.5. The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.					
F. Implementation of the monitoring plan	§122c				
F.1. How were the plans for implementation of the monitoring plan, data management, QA/QC procedures assessed? To what extent can the emission reductions achieved by the project by monitored ex-post and verified later by a DOE?	/1/	DR/I	The BCL management has established QA/QC procedures for data monitoring and data management. The emission reductions by the project activity can be achieved at full extent by monitored *ex-post* and verified later by a DOE.		OK
G. CDM consideration prior to starting date					
G1. The prior consideration of CDM for the project activity complies with EB 41 annex 46.	/1/	DR/I	Yes, please refer section 4.5.1, *CDM consideration and real action to secure CDM status* under additionality discussion		OK

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CAR 1 During the site visit, it was observed that Chanderia complex of BCL consists of two cement plants under the entities Birla Cement Works and Chanderia Cement Works and the Captive power plant under Chanderia Power. It is also seen that the order for the project activity is placed by Birla Corporation Limited. The Project Participant is requested to detail in the PDD the arrangement between the different entities with respect to the project activity and CERs. PP is also requested to provide copy of the agreement between the entities for the project activity.	A.2.1	Project participant wishes to clarify that Birla Corporation Limited (BCL), the flagship Company of the M.P.Birla Group has a number of cement manufacturing plants in different parts of India. Birla Cement Works (BCW) and Chanderia Cement Works (CCW) are among these cement plants owned by BCL and they are no separate company (please refer to the following web-link: http://www.birlacorporation.com/cementframe.html). Project participant would like to add that the Management of BCL has approved the project considering CDM revenue which is evident from the extracts of the minutes of meeting of the Board of Directors dated 31st January, 2008. So it is amply clear that BCL holds the ownership of BCW and CCW as well as any revenue accrued from sale of issued CERs.	OK. The official website of BCL and the annual report /7/ of the BCL have been verified to confirm that BCW and CCW are the entities of BCL. CAR 1 is closed
CAR 2 Host Country Approval letter needs to be provided for verification. The voluntary participation of the project needs to be confirmed against the letter of approval from the DNA	A.2.2 A.2.3 A.4.1	The project participant (*i.e.* Birla Corporation Limited) has received the Host Country Approval, conveyed through Ministry's letter no 4/9/2009-CCC dated 30th November 2009, for the CDM project namely 'utilization of the thermal energy content of the waste gas of clinker cooler and pre heater for power generation at a cement plant in Rajasthan'. The same is confirming the voluntary participation of	OK. The project participant has submitted the HCA letter no 4/9/2009-CCC dated 30 November 2009 /30/ for verification. Further, the issue of HCA for the project activity has been evidenced from the official web site of MoEF, the DNA of India http://cdmindia.nic.in/cdmindia/projectList.jsp?search=search).

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		the project. For verification the soft copy of the same is submitted to the DOE.	CAR 2 is closed.
CAR 3 The methodology permits consideration of new fossil fuel based CPP only if there is increase in demand for the electricity. The Project Participant is requested to justify the selection of new coal based plant as the identifiable generation source.	B.1.2 B.2.1 B.2.2 B.2.3 B.2.4 B.2.6 B.5.1	In accordance with the methodology one of the broad categories of options could be considered during baseline selection '*Supply from existing capacity or in case of increase of energy demand expansion of captive power generation source, if one exists; and*' Birla Corporation Limited, Chanderiya unit comprises of two cement manufacturing units *i.e.* Birla Cement Works (BCW) and Chanderiya Cement Works (CCW). Initially the combined capacity of these two units was about 1.848 million ton of clinker per annum (*i.e.* 1.188 million ton of clinker per annum from CCW and 0.66 million ton of clinker per annum from BCW). Thereafter project participant undertook the CCW up-gradation plan in which the same had been upgraded to 1.3365 million ton of clinker per annum. And the same led to a substantial increase in electricity demand as well. During the inception of the project activity project participant estimated the demand for electricity of the plant considering CCW up-gradation scheme. Although project participant has an existing captive thermal power plant (TPP), it was capable to cater	OK. The BCL has initiated action to expand the clinker capacity of CCW from 3500 MT/day to 4050 MT/day. This has been verified from the technical offer of A-Tec, Malaysia of dated 23 February 2007 /25/. The increase in capacity of CCW plant will lead to increased demand for electricity for clinker production as well as grinding and packing sections. Since the existing coal based captive power is unable to meet even the present electricity requirement, consideration of a new coal based plant as the identifiable generation source is justified. BCL has submitted revised PDD /1/ and the spreadsheet /20/ for calculation of the projected electricity requirement after commissioning of the CCW capacity enhancement project for verification. CAR 3 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		the demand partially. In view of this balance electricity requirement project participant assessed all probable electricity generation/supply sources. Following are the realistic and credible alternatives considered during the decision making: (i) Install a new fossil fuel (*i.e.* coal) based power plant as an extension of the existing captive power plant (ii) Install a waste heat recovery based power plant and meeting rest of the demand through grid The above justifies the consideration of a new coal based power plant (as an extension of new coal based power plant) as an identifiable generation source.	
CAR 4 The methodology requires identification of the current electricity supply and demand baseline from the electricity demand of the cement works, other local loads and the baseline generation from the existing CPP(E_{CEMENT}, E_{LOAD} and $EG_{ATEXIST}$) using the data of at least the two years prior to the start date of the project. However in PDD, these parameters are not derived as per the requirement of methodology. The project participant is requested to provide spreadsheet for the calculation of E_{CEMENT}, E_{LOAD} and $EG_{ATEXIST}$ along	B.2.1 B.2.2 B.2.3 B.2.4 B.2.6	In accordance with the guidance provided in the methodology Supply side – : - *'E_{CEMENT} and E_{LOAD} are the electricity demand of the cement works and other local loads, which should be included in the Project Design Document for at least two years prior to the start date of the project activity. Ex ante projection of these demands over the crediting period should be presented.*	OK. The PP has estimated *E_{CEMENT} $EG_{ATEXIST}$ and* considering the increase in electricity demand consequent to the clinker capacity enhancement project at CCW, which is as per the methodology. The E_{LOAD} is estimated based on the electricity meter reading for the past two years. The actual two year data of *E_{CEMENT}*, *E_{LOAD} and $EG_{ATEXIST}$* are presented in the revised PDD

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
with the supporting data.		*The meter records and production plan of the cement works and load design data of the cement works can be used for this estimate as can the data for other local loads (if any);'* As mentioned earlier (response to CAR 3) because of the capacity augmentation there will be an increase in electricity demand in the plant. That is why E_{CEMENT} has been derived from the metered historical records (to determine the electricity consumption pattern i.e. specific electricity consumption of several section of the plant) and future production plan of the cement works following the methodological guideline. Whereas E_{LOAD} has been determined solely based on the metered historical records of the other load as no such changes are expected to be happened during the crediting period. The detail spread sheet for calculation of E_{CEMENT} and E_{LOAD} has already been submitted to the DOE along with the supporting document. Demand side - '*$E_{GATEXIST}$ is the baseline electricity generation of the existing captive power plant (if existing). Production data for at least the two years prior to the start date of the project activity should be included in the Project*	/1/ the spreadsheet for estimation of baseline electricity consumption /22/. The supporting data provided for the calculations – electricity bills /6/, plant records for yearly power consumption data /8/ and the technical offer from A-Tec for capacity up-gradation of CCW /40/ were verified. CAR 4 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		Design Document. Ex ante projection of production capacity for the crediting period too should be included. The production records and plan of the captive power plant can be used for this estimate' Electricity generation data of the existing 29.8 MW captive thermal power plant (TPP) for the last two years prior to the start date of the project activity has been presented in the Project Design Document. However the ex-ante projection of $E_{GATEXIST}$ has been made based upon the design capacity of the plant, plant load factor (determined based upon historical data), auxiliary consumption (determined based upon historical data) following the guideline of the methodology.	
CAR 5 In line with the applicable methodology AM0024 version 02.1; the option with the highest IRR is the baseline scenario for waste heat recovery and electricity supply to the cement works. Thus the PP is requested to do the IRR analysis instead of levelised cost analysis.	B.3.1	As per the applicable methodology AM0024 version 02.1 project participant needs to identify technically feasible options for waste heat utilizations under the guidance provided in 1.A. and source of electrical energy supply for the cement plants under the guidance provided in 1.B. Furthermore it is also recommended to consider the following as electricity options. - *Supply from grid;* - *Supply from existing capacity or in*	OK. PP revised the financial indicator to demonstrate the investment comparison from levelised cost analysis to IRR in accordance to the methodology. The PDD /1/ and spreadsheet for financial analysis were revised accordingly /20/. CAR 5 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		case of increase of energy demand expansion of captive power generation source, if one exists;' Following the above guidelines under '**Identification of the baseline scenario**' of the applicable methodology AM0024 version 02.1 project participant has short listed the following alternatives/options - Scenario 1) Proposed project activity not undertaken as a CDM project activity - Scenario 2) Releasing the waste heat (available after type 1 waste heat utilization) to atmosphere in absence of the project activity and meeting the power demand by generating electricity in new fossil fuel (i.e. coal) based power generation system (as an extension of existing TPP) As the methodology recommends choosing the option with highest IRR as the baseline scenario for waste heat recovery and electricity supply to cement works, IRR analysis for rest of the two options (*i.e.* scenario 1 and scenario 3) has been presented herewith concluding scenario 2 as the baseline scenario (as asked by the DOE as well).	
CAR 6 The change in energy consumption/ton clinker	B.4.2	In line with the methodology AM0024, Ver	OK.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
needs to be monitored and considered in the calculation of project emissions. However, it is stated that there would not be any change in specific energy consumption for per ton of clinker production after the implementation of the proposed project activity and is taken as zero. The Project Proponent is requested to document energy consumption in TJ/ton in the baseline ex-ante, as per the methodology.	B.4.3 B.9.1 to B.9.9	02.1 project participant needs to compute the project emission following equation no 4 (as per the project design document). Here project participant needs to fix the '*pre-project energy consumption per unit output of clinker*' (*i.e.* EI_B) in the project design document based upon a combination of ex-ante design estimate of energy consumption plus available measured data (as instructed in the methodology). The same has been provided in the project design document in accordance with the guidance of the methodology. Here the '*ex-post energy consumption per unit output of clinker for the given year 'y''* (*i.e.* $EI_{P,y}$) will be monitored during the crediting period. However as per equation no 10 (as mentioned in the project design document) project participant needs to provide the design estimate of change in energy consumption of i^{th} clinker kiln (ΔEI_i) during computation of the ex-ante project emission. As per the technology supplier of the project activity there would not be any change in energy consumption in each kiln of BCW and CCW during clinker production under the project activity. That is why the design estimate of change in	The project participant revised the monitoring plan in line with the methodology, by including the change in energy consumption/ton clinker. The same is included in the revised PDD /1/. CAR 6 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		energy consumption of i^{th} clinker kiln (*i.e.* ΔEI_i) has been taken as zero at this stage.	
CAR 7 IPCC default value for carbon coefficient of fuel is used though national values are available for coal. Thus project proponent is requested to consider the national value for carbon coefficient of fuel.	B.5.1	In accordance with the suggestion provided by the DoE, national value for the carbon dioxide coefficient (tCO_2/ TJ) of fuel has been used. The PP wishes to clarify that national standard values for carbon dioxide coefficient (tCO_2/ TJ) of fuel used in clinker making as well as in captive thermal power plant have been considered for Emission Reduction calculation for the project activity as per the approved Methodology.	OK. PP has revised the value of the carbon dioxide coefficient of fuel used from IPCC default value to national value in the PDD /1/ and CER calculations /24/. CAR 7 is closed.
CAR 8 The PP is requested to update the monitoring plan by including all the parameters required by the monitoring methodology such as calorific value of fuel, oxidation factor etc.	B.8.1	The monitoring plan provided in the PDD is revised to include all the parameters to be monitored.	OK. The parameters required to be monitored as per the monitoring methodology are included in the monitoring plan of the revised PDD /1/. CAR 8 is closed.
CAR 9 The PDD broadly describes how the PP proposes to spend the money for sustainable development. However, it is not included in the monitoring plan.	B.12.2 B.12.3	Since the Approved Methodology considered for the project activity does not allow the revenue spending for sustainable development to be included in the Monitoring Plan, it is not mentioned in Section B.7.1 of the PDD. Instead the same has been included in Annexure- A of the PDD.	OK. The proposed utilization of CDM revenue for sustainability development has been included in the Annexure-A of the revised PDD /1/. CAR 9 is closed.
CL 1 The PP is requested to include the waste heat gas	A.1.2	In accordance with the suggestion made by DOE waste heat gas sources, captive	OK.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
sources, captive power plant and the local grid also in the project boundary, in line with the methodology. Schematic diagram of the project activity is to be included in the PDD and the capacities of the kiln clearly stated.		thermal power plant and local grid has been included in the project boundary. The required changes have also been made in the schematic diagram. As mentioned earlier there are two clinker manufacturing units in the Birla Corporation Limited, Chanderia Unit. The capacities of each unit are mentioned below Chanderia Cement Works (CCW): 1 kiln – 4050 ton of clinker per day or 1336500 ton of clinker per annum (considering 330 operational days per annum). Birla Cement Works(BCW): 2 kilns – 1000 ton of clinker per day for each of the kiln or 330000 ton of clinker per annum for each of the kiln (considering 330 operational days per annum). The same has also been mentioned in the Project Design Document as suggested by the DOE.	In the revised PDD /1/, waste heat gas sources, captive thermal power plant and local grid have been included in the project boundary. A schematic diagram of the project activity has also been provided in the revised PDD. CL 1 is closed.
CL 2 The project proponent is requested to provide the training and maintenance schedule of the WHRBs and turbine generators.	A.3.3	The training schedule has already been mentioned in the technical scheme provided by the technology supplier. The same has been provided to the DOE to substantiate the same. However regular maintenance will be carried like any other power plant (i.e. once in a year).	OK. Technical scheme of Dalian /3/ details the training schedule for the project activity. The proposed regular annual maintenance schedule is appropriate for the project activity.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
			CL 2 is closed.
CL 3 The project participant is requested to clarify the following points regarding the levelised cost analysis: ➢ Supporting documents for all the input parameters used ➢ The requirement of power import from the grid in the project scenario needs to be justified considering the average import during the past 3 years will be more than offset by the generation from the WHR based power. ➢ The reasons for estimating very low PLF for the WHR based power plant needs to be substantiated. ➢ The discrepancy in capacity of the new CPP needs to be clarified. In the spreadsheet it is stated to be 8 MW at one place and 7.3 MW at the other place. ➢ Basis for calorific value and price of coal ➢ The details of project and baseline investment cost ➢ Details of import of power from the grid for the past 2 years and its cost ➢ Basis for using station heating rate of 2867 kcal/kWh needs to be substantiated	A.3.1 A.3.2 A.3.3	- *'Supporting documents for all the input parameters used'* The same has been provided to the DOE to support each of the parameter used during unit cost of generation computation. - *The requirement of power import from the grid in the project scenario needs to be justified considering the average import during the past 3 years will be more than offset by the generation from the WHR based power.* During the inception of the project activity project participant estimated the demand for electricity of the plant considering CCW up-gradation scheme. Although project participant has an existing captive thermal power plant (TPP) of 29.8MW capacity, it was capable to cater the demand partially. In view of this balance electricity requirement project participant assessed all probable electricity generation/supply sources. After the investment comparison analysis it was found out that sourcing this balance electricity from new coal based power plant (as an extension of the existing captive thermal power plant) would be the most financially attractive option available to the project participant. So it can be	OK. PP decided to use IRR instead of the levelised cost analysis as the financial indicator to demonstrate the investment comparison analysis, in accordance to the methodology. The PDD /1/ and spreadsheet for financial analysis were revised accordingly. Supporting documents for the input parameters were provided for verification and the same is referred to in the spreadsheet for financial analysis /20/. The electricity demand of BCL, Chanderia will increase from the year 2009-2010 onwards, with the upgradation of the clinker production capacity of CCW from 3500 MT/day to 4050 MT/day. The production plan shows that with the increase in demand for electricity, even after commissioning the project activity, imports from the grid will continue. The technical offer from A-Tec Asia Sdn. Bhd. , Malaysia dated 23 February 2007 for upgradation of CCW plant /25/ and the spreadsheet for estimation of electricity

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
➢ Basis for the auxiliary power consumption, O&M costs and interest rate on loan Continuation of CL 3 In sensitivity analysis, PP is requested to calculate at what point of variation the input parameters the project IRR crosses the baseline IRR and justify why this variation is not possible.		concluded that in absence of the project activity project participant would have gone for the new coal based power plant. From the above it is evident that project activity is displacing the electricity generated by an identifiable generation source (*i.e.* a new coal based power plant) not the electricity being imported from grid. - *The reasons for estimating very low PLF for the WHR based power plant needs to be substantiated.* The technology penetration of waste heat recovery based power generation system in cement plant in India is almost nil because of the associated uncertainties related to waste heat availability from pre heater and cooler gas. Furthermore the low temperature of these gases along with frequent fluctuating operational parameters makes the project activity more difficult. The technology supplier has designed the system in such a way so that it could utilize every part of waste gas for power generation even if the same is not available throughout the year, like the power plant would be able to generate the rated capacity of 7.5 MW only if the mills are off which happens 4 hours per day only with all ideal operating conditions. Furthermore because of the associated intricacies with kiln	consumption /1/,/24/ were verified. The design basis of the project activity is detailed in the technical scheme provided by Dalian /3/, which states that WHRB unit will generate 5.8 MW for 20 hours a day when part of the waste gas will be used for pre-heating the raw materials and 7.5 MW power for 4 hrs a day when the pre-heaters are not in operation. Further the supplier guarantees 98% of the operating time of the cement kiln and 80% waste gas availability factor considering various operational and maintenance problems associated with the WHRB units in cement plants. The technical scheme of Dalian /3/ is verified. PP has corrected the discrepancies in the capacity of the project activity stated in the PDD /1/ to 7.5 MW. The supporting documents provided for the following input parameters were verified: • Calorific value of coal (technical offer from Cethar Vessels /10/) • Cost of coal used for power generation (Cost sheet of power plant /19/)

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		operation the operating parameters fluctuates frequently which would be a hindrance against rated capacity power generation both in mill on and off conditions. Here are those fluctuating parameters (identified by the technology supplier) : 1. Variation in clinker production- The power system is designed even to handle the quantum of waste gas equivalent to the maximum clinker production capacity of the CCW kilns i.e. 4400 tpd while the average production rate is 4050tpd. With less production there will be less waste gas generation and subsequently less power generation. 2. Variation in temperature of hot air coming from clinker cooler to the waste heat recovery system for power generation. 3. Variation in temperature of flue gas coming from pre heater to the waste heat recovery system for power generation. 4. Variation in ambient temperature Influence of each of these parameters on electricity generation figure has been illustrated in detail with mathematical	• Investment cost (Board note /2/, estimate prepared by Cethar Vessels /28/) • Cost of baseline plant (offer from Cethar vessels /10/) • Details of import of power from the grid for the past 2 years and its cost (electricity bills /6/) • Station heating rate (technical offer from Cethar Vessels /10/) • Auxiliary power consumption (technical scheme of Dalian /3/) • O&M costs (Board note /2/) • Interest rate on term loan (Weekly statistical statement of RBI /39/) Project proponent has done the baseline sensitivity analysis by variation of project cost, grid power tariff, O&M costs and power generation from waste gas /20/. a) The IRR touches the baseline IRR of 29.91% if the project cost decreases by 39.12%. Since the project activity is under implementation stage and the actual investment cost incurred so far verified from the purchase orders provided /27/ totals INR 443.5 million, (68.23% of the

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		equations in the technical scheme (provided by technology supplier). In this context the technology supplier has suggested to consider 80% waste gas availability factor (considering the influence of each of the parameters mentioned above) while computing the annual electricity generation figure (refer to the section 'design indexes' in the 'technical scheme'). To substantiate the above the 'technical scheme' has been submitted to the DOE. - *'The discrepancy in capacity of the new CPP needs to be clarified. In the spreadsheet it is stated to be 8 MW at one place and 7.3 MW at the other place.'* 8 MW is a typographical error. The same has been corrected and submitted to DOE. - *Basis for calorific value and price of coal* The calorific value of coal has been considered as recommended by the technology supplier of the coal based power plant. To substantiate the same, their techno-commercial offer has been submitted to the DOE. As the coal with almost similar calorific value is used in the existing captive power plant, cost of the same has been used during	estimated cost). Thus the 39.12% reduction in investment cost is not possible. b) With the plant load factor increased by 64.25%, the project IRR touches the baseline IRR of 29.91%. The plant load factor of 80% considered in the financial analysis is based on the technical scheme provided by Dalian /3/. With the PLF of 100%, the IRR improves only to 23.41%. Thus the 64.25% increase in PLF is not possible. c) The project IRR improves to the applied baseline IRR of 29.91% if the tariff increases by 64.25%. However, since the IRR is calculated on the basis of savings with respect to the grid power, the increase in tariff will also result in similar improvement in baseline IRR. Thus the increase in tariff will not have impact on the sensitivity analysis. d) With the O&M costs reduced by 100%, the project IRR improves to 20.1% only Since the maintenance is an integral part of any well run company, it is not possible to reduce the O&M costs by 100%.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		financial computation. To substantiate the same plant's audited cost sheet has been submitted to the DOE. - *'The details of project and baseline investment cost'* The baseline investment cost has been suggested by the technology supplier. Their techno – commercial offer has been submitted to the DOE. The project cost has been estimated during project approval stage in presence of external consultants considering their suggestion and the same has been presented to the Board for approval. To substantiate the same the relevant Note to Board has been presented to the DoE. - *Details of import of power from the grid for the past 2 years and its cost* The electricity bills for the past two years have been submitted to the DOE. - *'Basis for using station heating rate of 2867 kcal/kWh needs to be substantiated'* The same is suggested by the technology supplier. To substantiate the same, techno – commercial offer of the supplier has been submitted to the DOE.	CL 3 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		- ‘ *Basis for the auxiliary power consumption, O&M costs and interest rate on loan’* Auxiliary power consumption has been assumed as suggested by the technology supplier. The relevant supplier’s document has been submitted to the DOE. For the project activity, the O&M cost has been assumed as per the suggestion of external consultant who is looking after the whole execution of the project. In case of baseline power plant operation and maintenance cost of the existing Captive power plant has been used. In this context the audited cost sheets have been submitted to the DOE. The interest rate of bank loan has been assumed with reference to some recent bank loans offered to the project participant. The relevant bank document has been submitted to the DOE to substantiate the same. <u>Continuation of CL 3</u> a) The IRR touches the baseline IRR of 29.91% if the project cost decreases by 39.12%. Project participant has already spent more than 90% of the envisaged cost. And it is expected by completion of the	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		project the same will cross the envisaged project cost (*i.e*. INR 650 million) by a considerable margin. To substantiate the same the POs with a total value of INR 443.5 million (68.23% of the project cost) have been submitted to DoE. b) Electricity generation has been estimated as per the design specification. Even if we consider 100% waste heat availability factor and 100% plant availability factor the generation would increase by only 38% which is way below 64.25%. So the variation is not practically feasible. c) The project IRR touches the baseline IRR of 29.91% if the tariff increases by 64.25%. The average annual increase in electricity cost is 1.98% during 2002-03 to 2006-07, as per the web site of Ministry of commerce industry's Yearly wholesale price index for electricity for industry. Following the historical trend in grid power cost 64.25% increase of the same is not possible. d) When the O&M costs is reduced by 100%, the project IRR improves to 20.1% only Since the maintenance cannot be reduced by 100%, such a scenario is not practical	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 4 The project proponent is requested to do the sensitivity analysis for variations in investment cost and maintenance cost also and substantiate why this variation is not possible.	B.3.1 B.3.2 B.3.3	In line with the recommendation provided by the DOE a sensitivity analysis for variations in investment cost and maintenance cost also has been submitted to the DOE.	OK. PP has done sensitivity analysis for variations in investment and maintenance costs. Revised PDD /1/ and spreadsheet for investment analysis /20/ were provided for verification. CL 4 is closed.
CL 5 The Project Participant is requested to justify the selection of the region, scale and technology used for the demonstration of common practice analysis. Further, supporting documents needs to be provided for the data used.	B.3.1 B.3.2 B.3.3	PP hereby wishes to justify the selection of the region, scale and technology used for the demonstration of common practice analysis in the following way: As per EB39 Annex 10 (page 10), PP needs to provide common practice analysis that are "*operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc*". Selection of region- India Justification- So PP has chosen India as the region for demonstrating common practice. Selection of scale- PP has not limited its scope for any specific capacity of a cement plant.	OK. PP revised the PDD by changing the selection of region for common practice analysis from Rajasthan state to India. By selecting all cements in India, the scale of operation is not restricted. The installation of waste heat recovery boilers to recover the waste heat from the gas of clinker cooler and the pre-heater is the technology selected. Reference to the Cement Manufacturer's Association's data /41/ for the number of cement plants in India and links to the CDM projects were provided in the PDD. The selection of the region, scale and technology used for the demonstration of common practice analysis is deemed appropriate. The revised PDD /1/ and other references were verified.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		Selection of technology- Implementation of waste heat recovery boilers to recover and utilise the waste heat of the emanating gas of clinker cooler and the pre-heater. Justification- The project activity involves implementation of waste heat recovery boilers to recover and utilise the waste heat of the emanating gas of clinker cooler and the pre-heater. So, PP has considered this technology for common practice analysis. PP would like to inform that power generation from steam produced from waste heat of pre-heater gas and clinker cooler gas is not a common practice. Only five cement plants in India have decided to generate power using similar technology- Shree Cement, KCP Cement, India Cement, Ultra Tech Cement and J.K.Cement. All these projects are being implemented considering CDM revenue. So it is evident that the technology involved in the project activity is not at all financially lucrative and only CDM revenue is the lifeline for this kind of projects.	CL 5 is closed.
CL 6 Since the start date is prior to the date of web hosting, Project Proponent is requested to demonstrate that the CDM was seriously considered in the decision to implement the project activity.	B.3.4	In view of the high investment and economic unattractiveness (low IRR) of the project activity the board agreed to go ahead with the project with serious consideration of CDM revenue. To substantiate the same 'Official note to	OK. Copies of the note to the Board and the extracts of Board meeting /2/ were verified to confirm that CDM was seriously considered while deciding to go ahead with

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		board' and 'Board note' mentioning the consideration of CDM has been submitted to DOE.	the project activity. CL 6 is closed.
CL 7 Project Proponent is also requested to provide chronology of events under section B.5 of the PDD and demonstrate the continued real action to secure the CDM along with project implementation.	B.3.4	In accordance with the recommendation provided by the DOE the chronology of events has been presented in the project design document under section B.5. The same demonstrate the continued real action taken by project participant to secure CDM along with the project participant.	OK. PP has included the project chronology under section B.5 of the revised PDD /1/ to demonstrate the continued real action to secure CDM. CL 7 is closed.
CL 8 Project proponent has used 30% efficiency for the baseline plant. The supporting documents for the same needs to be provided.	B.5.2 B.5.3	Project proponent assumed 30% efficiency for the baseline coal based power plant as suggested by the external power plant manufacturer M/S Cethar Consulting Engineers (P) Ltd. (The same manufacture was also involved in supplying their existing captive coal based power plant in 2004-05). Their techno – commercial offer for this new coal based power plant has been submitted to the DOE as a supportive for this 30% plant efficiency. Furthermore it is a conservative one as their existing captive power plant (have been in operation since 2005) is even running at a much lower efficiency than the same.	OK. The technical offer of M/s Cethar Consulting Engineers (P) Ltd. /10/ for the coal based power plant states that 30% plant efficiency is considered as the design basis. Copy of the technical offer is provided for verification. CL 8 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 9 The Project Participant is requested to clarify how the auxiliary consumption of the WHRU is accounted and whether there will be additional power consumption due to the project activity in areas such as gas cleaning	B.9.1 To B.9.9	As per the suggestion made by the technology consultants the same has been considered to be 8%. There will be no additional power requirement (other than the 8% auxiliary consumption) under the project activity.	OK. The PP estimated the auxiliary consumption based on the technical scheme /3/ provided by Dalian. The verification of the technical scheme does not reveal any power requirement for gas cleaning etc. CL 9 is closed.
CL 10 The project proponent is requested to provide the accuracy of the monitoring equipment, measurement interval of the baseline data and the calibration interval of the instruments in the PDD.	B.10.5 To B.10.9	In accordance with the suggestion made by the DOE the changes has been made in the project design document.	OK. The revised PDD states that the accuracy of the monitoring equipment is as per the national or sectoral standard. The measurement and recording frequencies of monitoring data and the calibration interval of the instruments has also been stated in the PDD, which is deemed reasonable. The revised PDD /1/ verified. CL 10 is closed.
CL 11 The project proponent is requested to revise the start date of the crediting period since the 1 April 2010 stated in the PDD is not feasible.		The start date of the crediting period in the PDD is revised to 1 April 2011.	OK. The start date of the crediting period is revised in the updated PDD /1/. CL 11 is closed.

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
No Forward action requests were issued.		

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APPENDIX C

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

Indrajit Rana

Mr. Indrajit Rana holds double Bachelor Degree, in Chemical engineering and in Chemistry and is a certified energy auditor from Bureau of Energy Efficiency (BEE) of Government of India. Having an overall experience of around nine years. Prior to joining DNV having arround six years experience in Chemical process industry namely Petrochemical industry covering production, day to day production planning, energy efficiency improvement, safety, and capacity expansion of existing unit. His experience also covers the fields of environmental management and resource conservation including optimisation of steam consumption. Being shift incharge of HDPE unit he has acquired the knowledge of utility services like, nitrogen, hydrogen, plant air and water, steam, power and flare system. He is adequately experienced in handling many types of energy intensive rotating equipment like brine refrigerator (screw compressor), centrifugal and reciprocating compressor, blower, vertical monuted centrifugal pump, extruder, etc. and also experienced in handling DCS and advanced process control systems. He has knowledge in material balance and energy balance of HDPE plant. He has also experience in intrigated offsite plant (IOP) mainly waste water treatment plant, cooling tower operation and flare operation.

He has experience of around 3 years in validation and verification of numerous CDM projects in DNV, both in India & abroad.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in Energy demand.

Ravi Kumar Prabhu

Mr. Ravi Kumar Prabhu holds Bachelor's Degree in Chemical Engineering and has done Post Graduate Diploma course in Management and has an overall working experience of around twenty five years. Prior to joining DNV has around twenty three years experience in Chemical process industry (fertilizer & petrochemical manufacturing) covering production, technical services including energy audits and efficiency studies, waste heat recovery, efficiency studies of boilers, power plants, safety audits,pollution control activities and waste water treatment. With respect to the Thermal Power Plant, the job assignment included the monitoring of flue gas stack temperatures and excess air, efffiacy of fuel additives, condition of boiler refractory and insulation of steam lines, residual life assessment of boilers etc. His experience also includes 7 years in the Process design of fertilizer & petrochemical plants, wherein he was involved in the development of process flow diagrams, development of P&IDs, equipment design, HAZOP studies, procurement and commissioning activities. He has over two years experience in validation and verification of CDM projects in DNV and is also an EMS lead auditor.

His qualification, industrial experience and experience in CDM projects demonstrate sufficient sectoral competence in Chemical Process Industries, Thermal Energy Generation from fossil fuels, Heat distribution and Waste handling and disposal.

Soumik Biswas

Mr. Soumik Biswas holds a Bachelor of Science Degree in Chemistry and a Post Graduate Bachelor of Technology Degree in Chemical engineering. Having an overall experience of around 7 and a half years. Prior to joining DNV having 2 and a half years of experience in petrochemical industry covering process operations and monitoring with experience in handling DCS and advanced process control systems, handling heat recovery systems, waste handling systems and different types of rotating equipment. His experience also covers the fields of resource conservation and cleaner production in petrochemical industries. He has also received 6 Weeks in-plant training in thermal power plant operation, energy balance and efficiency assessment.

He has 5 years of experience in validation and verification of numerous CDM/JI/VCS projects in DNV, both in India & abroad.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in energy generation from renewable energy sources and waste handling and disposal to a reasonable degree

Santhosh Jayaram

Mr. Santhosh Jayaram holds a Master of Technology Degree in Environmental Technology. Having an overall experience of around 17 years. Prior to joining DNV having 9 years experience in cement industry covering manufacturing of cement, implementation of Environmental Management system against ISO 14001 in 3 cement units, co-ordinating Total Productive Maintenance (TPM) activities. Have done projects on utilisation of alternative fuels in cement kiln as well as on electro static precipitators (ESP)

He has experience of validation and verification of out more than 40 CDM projects as team leader and team member. This includes projects from India and abroad.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in cement sector to a reasonable degree.

Yang Xiao Shan, Alan

Mr. Yang Xiao Shan, Alan holds a Bachelor Degree in Material Science and Engineering. He has an overall experience of around four years. Prior to joining DNV, having around four years experience in cement manufacturing industry covering production, process optimization, quality assurance, waste heat recovery and energy efficiency improvement. His experience also covers the fields of environmental management and resource conservation including alternative fuels, cheap coal, and solid waste disposal in clinker kiln. He has also been actively involved in implementation of Quality Management System, ISO 9001 standard in cement manufacturing industry for more than three years.

He has experience of around 1 year in validation and verification of CDM and VCS projects.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in "Cement Manufacturing".