VALIDATION REPORT

"MARKET COKE WASTE HEAT RECOVERY PROJECT" IN SOUTH AFRICA

REPORT NO. 2012-9051

REVISION NO. 02

DET NORSKE VERITAS

VALIDATION REPORT

Date of first issue: 2012-04-14	ConCert Project No.: PRJC-361584-2012-CCS-ITA
Approved by: Ole A. Flagstad	Organisational unit: DNV KEMA Energy & Sustainability Accredited Climate Change Services
Client: Exxaro Resources Limited (Exxaro)	Client ref.: Ludwig Steinmann

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Summary:

Project Name: Market Coke Waste Heat Recovery Project

Country: South Africa

Methodology: ACM0012 **Version:** 04.0.0

GHG reducing Measure/Technology: Waste Heat Recovery to generate electricity

ER estimate: 414 032 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 "Market Coke Waste Heat Recovery Project" in South Africa, as described in the PDD, version 01.3 of 26 June 2013, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0012, version 04.0.0. Hence DNV requests the registration of the project as a CDM project activity.

Report No.: 2012-9051	Subject Group: Environment
Report title: "Market Coke Waste Heat Recovery Project" in South Africa	
Work carried out by: Giovanni Tenderini, Jan Van Evercooren Francisco Zamarron	
Work verified by: O. A. Flagstad, L. Nemecek, A. Dallasta	
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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNA	Designated National Authority
DNV	Det Norske Veritas
DVR	Draft Validation Report
EIA	Environmental Impact Assessment
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of approval
LCOE	Levelised Cost of Electricity
N/A	Not Applicable
N_2O	Nitrous oxide
NERSA	National Energy Regulator of South Africa
NGO	Non-governmental Organisation
MoC	Modalities of communication
ODA	Official Development Assistance
PDD	Project Design Document
PS	Clean Development Mechanism Project Standard
PFS	Pre-feasibility Study Report
SSCC	Semi Soft Coking Coal
tCO_2e	Tonnes of CO_2 equivalents
TCTA	Trans-Caledon Tunnel Authority
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard
WECM	Waste Energy Carrying Medium
WHRB	Waste Heat Recovery Boiler

1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed a validation of the project activity "Market Coke Waste Heat Recovery Project" in South Africa. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism 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 South Africa and no Annex I Party has been identified. The host party fulfils the participation criteria and have approved the project and authorized the project participant Exxaro Resources Limited (Exxaro). The DNA from South Africa confirmed that the project assists in achieving sustainable development.

The project correctly applies the baseline and monitoring methodology ACM0012, version 04.0.0 "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects".

The Market Coke Waste Heat Recovery Plant (the project activity) will utilise waste heat recovered from the coke oven flue gas (waste gas), produced as part of the coking pyrolysis process in the Market Coke Plant (the project facility) to produce electricity. As a result, the project results in reductions of CO_2 emissions that 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 414 032tCO_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. The monitoring arrangements described in the monitoring plan are feasible within the project design and it is DNV's opinion that the project participants are able to implement the monitoring plan.

In summary, it is DNV's opinion that the project activity "Market Coke Waste Heat Recovery Project" in South Africa, as described in the PDD, version 01.3 dated 26 June 2013 meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0012, version 04.0.0. Hence, DNV requests the registration of the project as a CDM project activity.

Milan and Oslo, 2 July 2013

Francisco Zamarron
CDM Validator
DNV Venice, Italy

Ole A. Flagstad
Approver,
DNV Climate Change Services AS

2 INTRODUCTION

Exxaro Resources Limited (Exxaro) has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the proposed CDM project activity "Market Coke Waste Heat Recovery Project" in South Africa (hereafter called "project"). This report summarises the 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 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 ACM0012 (version 04.0.0). The validation was carried out in accordance with the principles and the requirements for validation contained in the Validation and Verification Standard /58/.

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 document review

II follow-up actions (e.g. on-site visit and telephone or email interviews)

III the closing out of validation findings and the issuance of the final validation report and opinion

The following sections outline each step in more detail.

3.1 Document review

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

3.1.1 Documentation provided by the project participants

/1/ Carbon Asset Management Company Pty Ltd (Camco): *CDM-PDD for project activity "Market Coke Waste Heat Recovery Project" in South Africa*, Version 01 dated 25 January 2012 and version 01.3 dated 26 June 2013

/2/ Carbon Asset Management Company Pty Ldt (Camco): *IRR calculation and levelised cost analysis*, Version 1.6, dated 1 July 2013

/3/ Carbon Asset Management Company Pty Ldt (Camco): *Grid Emission Factor and Emission Reduction calculation*, Version 1.6, dated 16 November 2012

/4/ Carbon Asset Management Company Pty Ldt (Camco): *Electricity Tariff Calculation spread-sheet*, dated 16 July 2012

/5/ Engineering & Projects Company (E&PC): *Prefeasibility Study Report of the project activity*, Version 00, dated 1 February 2011

/6/ Synergistics: *Environmental Scoping Report*, dated 31 January 2012

/7/ Basil Read Matomo: *Coal fired steam power generation plant comparative cost estimate for a 60MWe plan at Lephalale (Grootegeluk)*, dated 17 July 2012

/8/ ACE Energy: *Levelised Cost of Electricity – Lephalale Power Plant*, dated 17 July 2012

/9/ Eskom Holding Limited to Exxaro Resources Limited (Exxaro): *2011 Electricity bill*, issued monthly in 2011

/10/ Exxaro Resources Limited (Exxaro): *Local Stakeholder Consultation Report*, dated 13 December 2011

/11/ Exxaro Resources Limited (Exxaro): *Exarro ZAR WACC calculation*, dated 23 April 2012

/12/ Exxaro Resources Limited (Exxaro): *Risk premium adopted for the proposed project activity*, dated 29 May 2012

/13/ Exxaro Resources Limited (Exxaro): *Implementation status of the project facility and project activity*, dated 21 May 2012

/14/ Exxaro Resources Limited (Exxaro): *ODA letter*, dated 21 May 2012

/15/ Exxaro Resources Limited (Exxaro): *Potential use of waste heat in the operation of the Grootegeluk Coal Mine*, dated 21 May 2012

/16/ Exxaro Resources Limited (Exxaro): *Potential use of waste heat in the char plant*,

dated 17 May 2012

/17/ Exxaro Resources Limited (Exxaro): *Grootegeluk annual GWh forecast*, dated 20 May 2012

/18/ Exxaro Resources Limited (Exxaro): *Tender for Clean Development Mechanism Consultant*, dated 8 March 2011

/19/ Exxaro Resources Limited (Exxaro) to Department of Energy (DNA of South Africa): *Project Identification Note (PIN)*, submitted on 6 September 2011

/20/ Exxaro Resources Limited (Exxaro): *Pre-feasibility study report of the project facility*, dated March 2011

/21/ Engineering & Projects Company (E&PC): *Technical and commercial evaluation report for the pre-feasibility study*, dated 9 May 2008

/22/ Engineering & Projects Company (E&PC*): Process Concept Design*, dated 1 February 2011

/23/ Carbon Asset Management Company Pty Ldt (Camco): *IRR calculation of the project facility*, Version 01, dated 4 December 2012

/24/ Prana Energy: *Operational expenditure budget for the Exarro Market Coke waste heat recovery project*, dated 29 May 2012

/25/ Prana Energy: *Salvage value for the Exarro Market Coke waste heat recovery project*, dated 9 July 2012

/26/ Prana Energy: *Maintenance cost estimate*, dated 24 October 2012

/27/ South African Revenue Service (SARS): *Deduction in respect of assets used by manufacturers or hotelkeepers and in respect of aircraft and ships, and in respect of assets used for storage and packing of agricultural products*, dated 21 November 2011

/28/ South African Revenue Service (SARS): *Deduction in respect of certain pipelines, transmission lines and railway lines*, dated 21 November 2011

/29/ South African Revenue Service (SARS): *Tax pocked guide*, dated 16 February 2010

/30/ Mogol Pos (local newspaper): *Public notice of the LSC*, dated 25 November 2011

/31/ China Metallurgical Engineering & Project Corporation to Exxaro Resources Limited (Exxaro): *Technical Proposal for the Market Coke Plant*, dated 30 May 2012

/32/ Department of Environmental Affairs: *National Environment Management: Air quality act*, 2004

/33/ ABB South Africa (Pty) Ltd: *Grootgeluk coal mine 33 kV substation refurbishment single line diagram*, dated January 2008

/34/ Engineering & Projects Company (E&PC) and Exxaro Resources Limited (Exxaro): *Pre-Feasibility Study Contract*, dated 31 May 2010

/35/ Synergistics and Exxaro Resources Limited (Exxaro): *Environmental Impact Assessment Contract*, dated 4 April 2011

/36/ Carbon Asset Management Company Pty Ltd (Camco) and Exxaro Resources Limited (Exxaro): *Contract for CDM consultant*, dated 9 June 2011

/37/ Department of Energy (DNA of South Africa): *Letter of No Objection*, dated 28 September 2011

/38/ Department of Economic development, environment & Tourism: *Receipt of the final Scoping Report*, dated 19 April 2012

/39/ Department of Economic development, environment & Tourism: *Final Scoping Report*

acceptance, dated 24 May 2012

/40/ Department of Energy (DNA of South Africa) to Carbon Asset Management Company Pty Ldt (Camco): *Notification of the Prior Consideration Notice*, dated 28 June 2011

/41/ CNI Technology CC: *Coke Making Facilities in South Africa*, dated 3 May 2012

/42/ Eskom Holding Limited: *2011 Annual report*, dated 21 June 2011

/43/ Trans-Caledon Tunnel Authority (TCTA): *Mokolo and Crocodile River (West) Augmentation Project (MCWAP-1) Tariff Setting 2013/14*, dated 13 July 2012

/44/ Eskom Holding Limited: *CDM calculations*, available at: http://www.eskom.co.za/c/article/236/cdm-calculations/

/45/ Eskom Holding Limited: *Calculation table*, available at: http://www.eskom.co.za/content/calculationTable.htm

/46/ Ingersoll-Rand South Africa: *Compressed air quote*, dated 13 August 2010

/47/ KoneCranes: *Quote for two 25 000 kg double girder electric overhead travelling crane*, dated 19 August 2010

/48/ Boiler & Heater Group Thermax Ltd: *Quote for a waste heat recovery boiler in coke oven plant*, dated 31 August 2010

/49/ GEA Heat Exchangers: *Quote for an air cooled condenser*, dated 22 February 2011

/50/ Siemens: *Quote for Two Condensing Steam Turbine Generator Sets, Turbine Type SST 400 with Auxiliaries*, dated 1 December 2010

/51/ Industrial Water Cooling (Pty) Ltd: *Turbine Auxiliary Cooling Package*, dated 1 August 2008

/52/ GE Water & Process Technologies: *Quote for Exxaro Grootegeluk water plant*, dated 8 August 2008

/53/ Consolidated Power Projects (Pty) Ltd: *Quote for civil and electrical works*, dated 18 August 2010

/54/ Shaw Controls (Pty) Ltd: *Quote for motor control centre*, dated 1 September 2010

/55/ RWW Engineering (Pty) Ltd: *Quote for 11 kV Switchgear for Exxaro - Grootgeluk Coal Mine*, dated 16 August 2010

/56/ Zest Electric Motors (Pty) Ltd: *Quote for transformers*, dated 15 August 2008

3.1.2 Letters of approval

/57/ Department of Energy (DNA of South Africa): *Letter of approval* dated 13 July 2012

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

/58/ CDM Executive Board: *Clean Development Mechanism Validation and Verification Standard*, version 03.0

/59/ CDM Executive Board: *Clean Development Mechanism Project Standard*, version 03.0

/60/ CDM Executive Board: *Clean Development Mechanism Project Cycle Procedure*, version 03.2

/61/ CDM Executive Board: *Baseline and monitoring methodology ACM0012*, version 04.0.0

/62/ CDM Executive Board: *Tool for the demonstration and assessment of additionality*, Version 6.0.0, dated 25 November 2011 and Version 6.1.0 dated 13 September 2012

/63/ CDM Executive Board: *Tool to calculate the emission factor for an electricity system*, Version 2.2.1, dated 29 September 2011

/64/ CDM Executive Board: *Tool to determine the remaining lifetime of equipment*, Version 01, dated 16 October 2009

/65/ CDM Executive Board: *Guidelines for the reporting and validation of plant load factors*, Version 01, dated 17 July 2009

/66/ CDM Executive Board: *Guidelines on additionality of first-of-its-kind project activities*, Version 01, dated 29 September 2011 and Version 02 dated 13 September 2012

/67/ CDM Executive Board: *Guidelines on common practice*, Version 01, dated 29 September 2011 and Version 02, dated 13 September 2012

/68/ CDM Executive Board: *Guidelines on the assessment of investment analysis*, Version 05, dated 15 July 2011

/69/ CDM Executive Board: *Glossary of CDM terms*, Version 05, dated 19 August 2009 and Version 06, dated 2 March 2012

/70/ CDM Executive Board: *Information note: previous rulings related to the appropriateness of benchmarks for project activities utilizing waste heat/waste gas for power generation*, dated 4 December 2009

/71/ CDM Executive Board: *Prior Consideration of the CDM*, available at: http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

/72/ CDM Executive Board: *Registered projects*, available at: http://cdm.unfccc.int/Projects/registered.html

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

/73/ National Treasury of the Republic of South Africa: *Budget Review 2012*, dated 22 February 2012

/74/ Department of Energy (DNA of South Africa): *Record of Decision (EIA) for CDM projects*, dated 4 April 2012

/75/ NERSA: *NERSA review Eskom's tariffs for the period 1 April 2012 to 31 March 2013*, dated 9 March 2012

/76/ IPCC: *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, dated October 2006

/77/ The Association for the Advancement of Cost Engineering (AACE International): *AACE International Recommended Practice No. 18R-97 – Cost estimate classification system – as applied in engineering, procurement, and construction for the process industries*, TCM Framework: 7.3 – Cost Estimating and Budgeting, 2 February 2005

/78/ Resbank: *Selected historical exchange and interest rates*, available at: http://www.resbank.co.za/Research/Rates/Pages/SelectedHistoricalExchangeAndInterestRates.aspx

/79/ U.S. Department of Energy – Intermountain Clean Energy Application Center: *Waste Heat to Power Technologies*, available at: http://www.intermountaincleanenergy.org/cleanenergy/whr/heat-to-power.aspx

/80/ Waste Heat Solutions LLC: *Project Initiation: First Steps*, dated 1 October 2007 and available at:

http://www.northwestcleanenergy.org/NwChpDocs/Liebowitz%20presentation.pdf

3.2 Follow-up actions

From 13 to 14 March 2012 Giovanni Tenderini and Jan Van Evercooren from DNV visited Exxaro Resources Limited (Exxaro) headquarters in Pretoria and the Market Coke WHR Plant site in the municipality of Lephalale and performed interviews with project stakeholders.

Moreover on 12 March 2012 DNV visited the DNA of South Africa to mainly discuss about the national regulatory requirements related to several projects under validation in the country, including the proposed project activity.

	Date / Type of interview	Name / Organization	Topic
/81/	12 March 2012 ☐ On-site ☒ Face-to-face at office ☐ Telephone ☐ E-mail	Ndiafhi Patrick Tuwani, Lufuno Mukwevho, Takalani Rambau, Sandra Motshwanedi / DNA of South Africa	• Letter of Approval • Prior notification • Laws and regulations • Sustainability development indicators • Environmental Impact Assessment • Local Stakeholder Consultation
/82/	13 – 14 March 2012 ☒ On-site ☒ Face-to-face at office ☐ Telephone ☐ E-mail	Ludwig Steinmann / Exxaro Resources Limited (Exxaro)	• Project design • Project implementation
/83/	13 – 14 March 2012 ☒ On-site ☒ Face-to-face at office ☐ Telephone ☐ E-mail	Brian van Oerle, Piet Kotze / Prana Energy	• Project design • Application of selected baseline and monitoring methodology • Baseline identification • Additionality • Monitoring • Environmental impacts
/84/	13 – 14 March 2012 ☒ On-site ☒ Face-to-face at office ☐ Telephone ☐ E-mail	Glen Louwrens / Camco	• Project design • Application of selected baseline and monitoring methodology • Project boundary • Baseline identification • Additionality • Monitoring • Algorithms and/or

formulae used to determine emission reductions
- Environmental impacts
- Comments by local stakeholders

3.3 Closing out of validation findings

The objective of this phase of the validation was to resolve any issues which needed be clarified prior to DNV's conclusion on the project's compliance with applicable CDM requirements. 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 for the project activity "Market Coke Waste Heat Recovery Project" in South Africa is enclosed in Appendix A to this report.

Table 2 of the validation protocol documents the findings of the desk review of the project design documentation and follow-up interviews with project stakeholders. Any findings raised in Table 2 are listed in Table 3 of the protocol, and changes to the description of the project design as a result of these findings will be addressed in Table 3. Table 2 thus may not reflect all aspects of the project as described in the final PDD submitted for registration.

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 applicable 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.

The validation identified [ten] CARs, [twenty-eight] CLs and [one] FAR. The CARs and CLs were satisfactorily addressed by the project participants by among other revising the PDD (please refer to Table 3 in Appendix A for further details). In addition to the changes made to the PDD as a result of the validation findings, the following changes to the PDD (version 01.3

dated 26 June 2013) were made compared to the version of the PDD published for stakeholder comments (version 01 dated 25 January 2012):

- The PDD initially was adopting the Validation and Verification Manual, Version 1.2, but due to time constrain related to submission deadline, on July 2012 it was revised to comply with VVS /58/.
- The emission reductions estimation decreased from 491 904 to 414 032 tCO_2 per year due to the fact that they were previously calculated considering the gross capacity instead of the net capacity of the plant.

As part of version 02 of the Validation Report which was issued after the reception of three requests for review from members of the Board or one request for review from a Party involved, DNV:

a) further explained how it has validated the suitability of the investment costs (hard CAPEX and soft CAPEX);
b) further explained how it has validated the suitability of the OPEX (both fixed and variable) in accordance to VVS version 2, paragraph 120 (b)

Moreover in the revised PDD the project participant further detailed the extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity. As a consequence, DNV revised its assessment and found the analysis made by the project participant to be in compliance with Option 2 of Annex 1 of the methodology ACM0012 (version 04.0.0) /61/.

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 **corrective 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***	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA 1.1 competence	TA 4.3 competence	Financial expertise
Team leader (Validator)	Zamarron	Francisco	Italy	✓			✓				
Validator	Van Evercooren	Jan	Belgium	✓	✓	✓				✓	
Assessor under training	Tenderini	Giovanni	Italy	✓	✓	✓			✓		✓
Technical reviewer	Flagstad	Ole	Norway					✓			
TA input to TR	Nemecek	Lumir	Czech Republic						✓		
TA input to TR	Dallasta	Alessandro	Italy							✓	

The qualification of each individual validation team member is detailed in Appendix B 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 01.3 dated 26 June 2013.

4.1 Comments by Parties, stakeholders and NGOs

The PDD, version 01 dated 25 January 2012, was made publicly available on the CDM website

http://cdm.unfccc.int/Projects/Validation/DB/4BNU004NGLU4TO0CVAU4Y32JN3HA8I/view.html

and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 28 January 2012 to 26 February 2012.

No comments were received during the Global Stakeholder Consultation.

4.2 Approval, authorization and contribution to sustainable development

The project participant is Exxaro Resources Limited (Exxaro) of South Africa. The host Party (South Africa) meets all relevant participation requirements.

A letter of approval (LoA) /57/ was issued by DNA of South Africa on 13 July 2012, authorizing Exxaro Resources Limited (Exxaro) as project participant and confirming that the project assists in achieving sustainable development.

The letter of approval was received from the project participant. DNV does not doubt the authenticity of the letter of approval. DNV considers the letters are in accordance with paragraphs 39-42 of the VVS /58/.

4.3 Modalities of communications

DNV has performed due diligence on the Modalities of Communications (MoC) statement submitted by the project participants in accordance with applicable requirements in the VVS as documented in section A.4 of Table 2 in the validation protocol in Appendix A to this report. DNV was able to confirm the information contained in the MoC and that the MoC complies with all relevant forms and requirements.

4.4 Project design

The project activity will be located at the Grootegeluk Coal Mine on the farm Daarby 458 LQ, approximately 25 km west of the town of Lephalale (formerly Ellisras), in the Limpopo Province of South Africa. The decimal coordinates for the project are: 23.6453° South and 27.5544° East, corresponding to the north eastern corner of the WHR power plant (point R9 in the layout of the project activity and facility provided in the PDD). The coordinates were verified by DNV validation team during the site visit.

During the site visit it was verified that both the project activity, i.e. the Market Coke Waste Heat Recovery Project and the project facility, i.e. the Market Coke Plant, are greenfield /82//83/.

As verified in the Prefeasibility Study /5/, the purpose of the project activity is to utilise waste heat recovered from the coke oven flue gas (waste gas) after tertiary combustion, produced as part of the coking pyrolysis process in the greenfield project facility, to produce electricity. The project facility, where the coking pyrolysis process takes place, is part of the Grootegeluk coal Mine. During the coking pyrolysis process, coal from the Grootegeluk Coal Mine is heated in coke ovens in the absence of oxygen (air), driving off volatile matter in the coal to produce market coke. Large volumes of hot coke oven flue gases are produced in the coking pyrolysis process and these hot waste gases contain energy in the form of waste heat which can be recovered. In the project activity, steam is produced in four waste heat recovery boilers (WHRB) using the waste heat recovered from the hot coke oven flue gas after tertiary combustion. The steam is expanded through 2 x 30 MW turbines to produce mechanical energy used to drive alternators to produce approximately 462 000 MWh/year.

According to the project facility process description provided in the PDD, the primary air is introduced, mainly through ports in the coke oven doors, to initiate the partial combustion reaction that provides the heat to liberate the first volatiles from the coal (primary combustion). This partially combusted gas is drawn into channels in the oven floor where secondary combustion air is added which oxidizes most of the volatiles to provide sustained heat for the coking process (secondary combustion). The amount of secondary air added in controlled to regulate the oven temperature and is sub-stoichiometric to prevent overheating. The final flue gas leaving the coke oven via the overhead ducts, thus still contains combustible components (CO and H_2 gas) which is oxidized (for safety and environmental reasons) by the addition of tertiary combustion air, in excess of the stoichiometric requirement, outside the oven (tertiary combustion). DNV confirms that the project design engineering reflects current good practices.

The expected thermodynamic conditions of the waste heat at WHRB inlet and outlet is given in the table below. The abovementioned thermodynamic conditions have been sourced from the Pre-feasibility Study (PFS) /5/. According to DNV sectorial competence they are feasible within the project design.

Description	Value	Unit
Inlet		
Flow rate	583 139	Nm^3/hr
Temperature	1 230	°C
Energy Available	274	MW
Outlet		
Flow rate	583 139	Nm^3/hr
Temperature	170	°C

The energy available specified in the table here above is the thermal energy obtained by cooling the exhaust gas stream from 1230°C down to the ambient temperature of 25°C. DNV estimated that cooling the exhaust gas stream from 1230°C down to 170°C would results in a thermal energy of about 241 MW. The available thermal energy is deemed to be sufficient to guarantee the expected project performances.

The project facility is currently at the Bankable Feasibility Study (BFS) phase /13/ and the potential to generate electricity from waste heat recovered in the Market Coke Waste Heat Recovery Plant (the project activity) is being investigated through the completion of a Pre-feasibility Study (PFS) /5/.

As confirmed by a letter signed by the carbon manager of Exarro Resources Limited (Exxaro) /13/ and discussed during the site visit /82//83/, the project activity and the project facility will independently seek approval from Exxaro's Board of Directors presenting their own calculated project returns. The project participant clarified that the investment decision to proceed with the implementation of the proposed project activity will be taken only after the eventual CDM registration, due to the need for the revenues from the sale of CERs to make the project activity more financially attractive.

The project participant clarified and documented) /5//13/ the implementation status of both the project facility and the project activity.

The accuracy and completeness of project description was verified through the review of a Pre-feasibility Study Report /5/ and through a site visit /82/ /83/ /84/, during which DNV validation team was able to confirm that the proposed project activity is a Greenfield project.

The starting date of the proposed project activity is the expected construction contract signing date, which is expected to be 30 June 2013.
During the site visit the project participant confirmed that no commitment to expenditures related to the implementation or related to the construction of the project activity has been taken so far /82//83/. The above was confirmed also by the DNA /81/.
The starting date is therefore in accordance with the definition indicated in the Glossary of CDM terms /69/, since it is the earliest date at which either the implementation or construction or real action of a project activity will begin.

The operational lifetime of the waste energy generation equipment is over 25 years, as confirmed by the Technical Proposal for the Market Coke Plant /31/ issued by a Chinese contractor.
The operational life time of the project activity is 20 years as confirmed by both the Pre-Feasibility Study Report /5/ and by an estimation made by a local engineering company /25/.
It is DNV opinion that the selected operational time is reasonable and confirmed by proper evidences.

The start date of the crediting period is defined as the date of project commissioning, which is expected on 1 August 2015. A fixed crediting period of 10 years has been chosen by the project participant. The start date, the type and the length of the crediting period are clearly defined and reasonable.

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.

4.5 Application of selected baseline and monitoring methodology

The project correctly applies the approved baseline methodology ACM0012 (version 04.0.0) /61/ titled "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects". The applied baseline methodology is justified as it has been demonstrated that the project activity ensures that:

Applicability conditions of ACM0012 (version 04.0.0)	Rationale
The consolidated methodology is applicable to project activities implemented in an existing or Greenfield facility converting waste energy carried in identified WECM stream(s) into useful energy. The WECM stream may be an energy source for: - Generation of electricity; - Cogeneration; - Direct use as process heat source; - Generation of heat in element process; - Generation of mechanical energy; or - Supply of heat of reaction with or without process heating.	The project activity converts waste energy carried in identified WECM stream into useful energy. The WECM stream is an energy source for electricity generation, as detailed in the prefeasibility study report (PFS) /5/ and in the environmental scoping report /6/. As verified during the site visit /82//83/, the proposed project activity is implemented in a Greenfield facility.
In the absence of the project activity, the WECM stream: a) Would not be recovered and therefore would be flared, released to atmosphere, or remain unutilized in the absence of the project activity at the existing or Greenfield project facility; or b) Would be partially recovered, and the unrecovered portion of WECM stream would be flared, vented or remained unutilised at the existing or Greenfield project facility.	As confirmed by a letter signed by Grootegeluk Coal Mine manager /15/ and verified during the site visit /82/, Grootegeluk Coal Mine currently produces various types of coal which is supplied to the local and international markets. The pit is an open cast operation and uses the typical shovel and truck method of mining. Once the coal is mined, dependent on the type of coal, it is washed at one of 6 beneficiation plants situated on the site. These plants are typical cyclone equipped plants. None of the above operations have the potential to utilise the waste heat, partially or in full, generated by the proposed Market Coke Plant and therefore the waste heat from the coke ovens would remain unutilised. During the site visit it was noticed that a char plant is operating at Grootegeluk Coal Mine /82//83/. However, as confirmed by a letter signed by Reductants Business Unit Manager of Exarro Resources Limited (Exxaro) /16/ and verified during the site visit /82/, the char plant situated at Grootegeluk Coal Mine does not have the potential to utilise the waste heat, partially or in full, generated by the proposed Market Coke Plant and therefore

Applicability conditions of ACM0012 (version 04.0.0)	Rationale
	the waste heat from the coke ovens would remain unutilised. DNV has therefore enough elements to conclude that in the absence of the project activity the WECM stream would neither be recovered nor partially be recovered and therefore would be flared, released to atmosphere, or remain unutilized.
Project activities improving the WECM recovery may (i) capture and utilise a larger quantity of WECM stream as compared to the historical situation in existing facility, or capture and utilise a larger quantity of WECM stream as compared to a "reference waste energy generating facility"; and/or (ii) apply more energy efficient equipment to replace/modify/expand waste energy recovery equipment, or implement a more energy efficient equipment than the "reference waste energy generating facility".	As verified during the site visit /82//83/, the proposed project activity is implemented in a Greenfield facility and therefore there are not pre-project waste heat recovery activities in the project facility. The project is thus not improving the WECM recovery and this is N/A.
The methodology is applicable under the following conditions: - For project activities which recover waste pressure, the methodology is applicable where waste pressure is used to generate electricity only and the electricity generated from waste pressure is measurable; - Regulations do not require the project facility to recover and/or utilize the waste energy prior to the implementation of the project activity; - The methodology is applicable to both Greenfield and existing waste energy generation facilities. If the production capacity of the project facility is expanded as a result of the project activity, the added production capacity must be treated as a Greenfield facility; - Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the project facility shall not be included in the	- As described in the PFS /5/ and in the environmental scoping report /6/, the project activity does not recover waste pressure. Therefore this is N/A. - According to the National Environment Management: Air quality act (2004) /32/, the waste gas generated in the ovens of market coke plant would need to be combusted and vented prior to release it to the atmosphere. As confirmed by the DNA /81/, no South African regulations require the project facility to recover and/or utilize the waste energy prior to the implementation of the project activity. - As verified during the site visit, the proposed project activity is implemented in a Greenfield facility. - The project participant included the Abnormal operation of the project facility including emergencies and shut down in the list of parameters to be monitored, as required by the methodology ACM0012 (version 04.0.0) /61/.

Applicability conditions of ACM0012 (version 04.0.0)	Rationale
emission reduction calculations.	This parameter has to be monitored to demonstrate that no emission reduction is claimed for the hours during the abnormal operation of the part of project facility which have impact on waste energy generation and recovery. In conclusion, all the conditions listed in this applicability criterion are met by the proposed project activity.
If multiple waste gas streams are available in the project facility and can be used interchangeably for various applications as part of the energy sources in the facility, the recovery of any waste gas stream, which would be totally or partially recovered in the absence of the project activity, shall not be reduced due to the implementation of CDM project activity. For such situations, the guidance provided in Annex 3 shall be followed.	As described in the PFS /5/ and in the environmental scoping report /6/, no multiple waste gas streams are available in the project facility, therefore this is N/A.
The methodology is **not** applicable to the cases where a WECM stream is partially recovered in the absence of the CDM project activity to supply the heat of reaction, and the recovery of this WECM stream is increased under the project activity to replace fossil fuels used for the purpose of supplying heat of reaction.	As verified during the site visit /82//83/, the proposed project activity is implemented in a Greenfield facility and therefore there are not pre-project waste heat recovery activities in the project facility. The WECM stream is thus not partially recovered in the absence of the proposed CDM project activity.
This methodology is also **not** applicable to project activities where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel generator) to generate power. However, the projects recovering waste energy from single cycle and/or combined cycle power plants for the purpose of generation of heat only can apply this methodology.	As described in the PFS /5/ and in the environmental scoping report /6/, the project activity recovers waste heat produced as part of the coking pyrolysis process in the project facility and does not recover waste energy from a single and or combined cycle power plant.
The emission reduction credits can be claimed up to the end of the lifetime of the waste energy generation equipment. The	Emission reduction credits can be claimed only during the crediting period, which is, according to the PDD, fixed and with a duration of 10 years.

Applicability conditions of ACM0012 (version 04.0.0)	Rationale
remaining lifetime of the equipment should be determined using the latest version of the "Tool to determine the remaining lifetime of equipment".	The operational lifetime of the waste energy generation equipment is over 25 years, as confirmed by the Technical Proposal for the Market Coke Plant /31/ issued by a Chinese contractor. Tool to determine the remaining lifetime of equipment /64/ is not applicable for the determination of the remaining lifetime of the waste energy generation equipment since both the project facility and activity are greenfield.
The extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity will be determined in accordance with the procedures provided in Annex 1 (for Greenfield project facilities) and in Annex 2 (for existing project facilities) to this methodology.	As assessed in Criterion 2, the project facility is a Greenfield waste heat generating facility. Therefore, the extent of use of waste energy for electricity generation from the waste energy generation facilities in the absence of the CDM project activity has been determined in accordance with the procedures provided in the Annex 1 to the methodology ACM0012 version 4.0.0 /61/. The assessment of the application of Annex 1 is provided at the end of this paragraph.
In addition, the applicability conditions included in the tools referred to above apply.	The relevant scope and applicability criteria of the tools are assessed and demonstrated for use in the tables below.

Applicability conditions of Tool for the demonstration and assessment of additionality (version 6.0.0)	Rationale
This tool provides for a step-wise approach to demonstrate and assess additionality. These Steps include: a) Identification of alternatives to the project activity; b) Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible;	The project activity has demonstrated its additionality following the step-wise approach described in the Tool /62/. Therefore this applicability criterion has been fulfilled.

Applicability conditions of Tool for the demonstration and assessment of additionality (version 6.0.0)	**Rationale**
c) Barriers analysis; and d) Common practice analysis	
Based on the information about activities similar to the proposed project activity, the common practice analysis is to complement and reinforce the investment and/or barriers analysis. The Steps are summarized in the flow-chart on page 2 of this document.	The project participant carried out a common practice analysis to complement and reinforce the investment analysis. Therefore this applicability criterion has been fulfilled.
The document provides a general framework for demonstrating and assessing additionality and is applicable to a wide range of project types. Some project types may require adjustments to this general framework.	According to methodology ACM0012 (version 04.0.0) /61/, the additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the CDM Executive Board, available at the UNFCCC CDM website. Therefore the tool /62/ is applicable to the proposed project activity.
This tool does not replace the need for the baseline methodology to provide a step-wise approach to identify the baseline scenario. Project participants that propose new baseline methodologies shall ensure consistency between the determination of additionality of a project activity and the determination of a baseline scenario. Project participants can also use the "Combined tool to identify the baseline scenario and demonstrate additionality", which provides a procedure for baseline scenario identification as well as additionality demonstration.	The baseline scenario has been determined in accordance with the methodology /61/, where realistic and credible alternatives have been identified in a step wise approach for the most plausible baseline scenario. The tool /62/ has therefore not replaced the need for the baseline methodology In conclusion this applicability criterion has been fulfilled.

Applicability conditions of Tool to calculate the emission factor for an electricity system (version 2.2.1)	**Rationale**
This methodological tool determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the combined margin" emission factor (CM) of	The project activity will displace electricity generated by power plants connected to the South African electricity system. The project participant calculated a combined margin emission factor (CM) to determine the

Applicability conditions of Tool to calculate the emission factor for an electricity system (version 2.2.1)	Rationale
the electricity system. The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the operating margin" (OM) and the "build margin" (BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CDM project activity. The build margin is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed CDM project activity.	relevant CO_2 emission factor. Therefore this applicability criterion has been fulfilled.
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	As described in the PFS /5/ and in the environmental scoping report /6/, the project activity results in saving of electricity that would have been provided by the grid. Therefore this applicability criterion has been fulfilled.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, the conditions specified in Annex 2 - Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10% of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10% of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	In the calculation of the grid emission factor /3/, only grid power plants are included. Conditions specified in Annex 2 are therefore N/A.

Applicability conditions of Tool to calculate the emission factor for an electricity system (version 2.2.1)	Rationale
Note that this tool is also referred to in the Tool to calculate project emissions from electricity consumption for the purpose of calculating project and leakage emissions in case where a project activity consumes electricity from the grid or results in increase of consumption of electricity from the grid outside the project boundary.	As described in the PFS /5/ and in the environmental scoping report /6/, the project activity does not result in increase of consumption of electricity from the grid outside the project boundary.
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project electricity system has been identified to be the South African electricity grid. South Africa is not an Annex I country.

Assessment of the extent of use of waste energy from the waste energy generation facility in the absence of the CDM project activity

According to the methodology /61/, the extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity has been determined in accordance with the procedures provided in Annex 1 (for Greenfield project facilities) to this methodology /61/.

Option 1: Assessment of other existing facilities

1. The Greenfield (or new) facility generating the WECM used in the CDM project activity should be categorized based on following criteria applicable to project facility: (i) industry sector; (ii) product manufactured, its specifications and applications; (iii) production capacity; (iv) quality of raw material used; (v) process flow or technology type; (vi) configuration of the facility; (vii) facilities implemented in the previous 10 years.

The following categorization has been done for the project facility (data were verified against the Pre-feasibility study report of the project facility /20/):

(i) Industry sector: Coke manufacturing sector;
(ii) Product manufactured: Coke for the ferroalloy industry in South Africa;
(iii) Production capacity: 435 000 – 500 000tpa
(iv) Quality of raw material used: SSCC from the Grootegeluk Coal Mine;
(v) Process flow or technology type: Coking pyrolysis process and non-recovery coke oven type;
(vi) Configuration of the facility:
(vii) Facilities implemented in the previous 10 years: as further demonstrated in the common practice analysis, there are no facilities implemented in the previous 10 years.

2. Based on the literature from the recognized sources, or from surveys in the relevant industry sector, these facilities which follow the criteria mentioned above should be

listed. The selected facilities can vary by +/-10% in terms of capacity of the facility as compared to the proposed facility under CDM.

The project participant carried out the common practice analysis covering the entire host country (South Africa). According to a sectorial expert opinion /41/, and confirmed by the DNA /81/, in South Africa there are only 3 coke manufacturing plants. These include plants located at:

- Vanderbijlpark – 6 coke batteries with gas cleaning and by-product recovery;
- Pretoria – 1 coke battery with gas cleaning and by-product recovery;
- Newcastle – 3 coke batteries with gas cleaning and by-product recovery.

Among the identified coke manufacturing plants, none of them has coke batteries of the heat recovery type. Indeed the three existing coke plants are using coke batteries with the by-product recovery technology.

According to the methodology /61/, for the use of Option 1, it is necessary that at least five facilities are analysed to arrive at "reference facility" practice, however all 3 plants apply technologies different that the technology applied in the project facility. Therefore, DNV confirms that the Option 2 of annex 1 ("Assessment of alternative design of the project facility") has been correctly selected to demonstrate the extent of use of WECM, as there is less than five facilities analysed to arrive at "reference facility" practice in line with the applied methodology ACM0012 version 4.0.0 /61/.

Option 2: Assessment of alternative design of the project facility

According to the methodology /61/, the manufacturer of the project facility will be invited to submit an alternative design including the usage of WECM that is recovered under project.

The alternative designs of the project facility, including the usage or no usage of the WECM, were evaluated according to the choice of coke oven technology in the Prefeasibility Study of the project facility /20/. In order to prepare the PFS /20/, Exxarro invited several manufactures to submit technical and economical proposals related to the project facility /21/. Those proposals were evaluated by an independent engineering company in 2008 /21/.

In light of the additional possibility to use the WECM, two different alternative designs have been identified and consequently analysed in the PDD in respect of the methodology as follows:

1. Scenario 1: project facility is constructed with no usage of WECM. WECM is combusted (flared) and vented to the atmosphere and power would be supplied from the national grid;
2. Scenario 2: project facility with usage of all the available WECM, i.e. WECM is recovered for power generation;

As far as the usage of all the WECM is concerned, a combined process and financial model was developed by the project activity PFS authors to determine the optimum steam conditions for the steam cycle and the number of waste gas heat generators and turbines. The Process Concept Design report documents the process and financial modelling to determine the optimum process solution for the proposed project activity /22/. A number of different configurations, all recovering 100% of WECM, were considered including:

- Different steam conditions (32 bar(a) and 410°C, 45 bar(a) and 445°C, 65 bar(a) and 485°C);
- Heat recovery boiler configuration (2 or 4 WHRSGs);

- Turbine configuration (this considered only 2 x 30 MW steam turbines).

The maximum number of configurations based on the variables above is 6 and the optimisation model developed considered all 6 these possible configurations. The study concluded that the optimum (most financially attractive) configuration is: four Waste Heat Steam Generators (WHSGs), and two Turbines at 65 bar(a) and 485°C steam condition. This scenario is the project activity without CDM and given that it is the most financially attractive of the 6 possible configurations, considering this configuration only in the analysis in Option 2 (Scenario 2) is deemed conservative.

According to the methodology /61/, the project participants have to demonstrate through investment analysis that the use (or no use) of WECM(s) of such alternative design would have been the baseline scenario for the waste energy generated in the Greenfield facility.

A levelised cost analysis and an investment comparison analysis are used for the 2 alternatives presented above to determine which one is the most attractive /2/. For completeness a third scenario considering partial usage of WECM is also considered:

1. Scenario 1: project facility is constructed with no usage of WECM. WECM is combusted (flared) and vented to the atmosphere and power would be supplied from the national grid;
2. Scenario 2: project facility with usage of all the available WECM, i.e. WECM is recovered for power generation;
3. Scenario 3: project facility with usage of 50% of the available WECM for power generation. While the plant load factor remains the same, the installed generation capacity of Scenario 3 is assumed to be half (30 MW) of the capacity of Scenario 2. As further described here below, the electricity generated in Scenario 3 is therefore equal to the 50% of power generation in Scenario 2. For comparison purposes, the remaining 50% (compared to scenario 2) of electricity is assumed to be supplied from the national grid.

The investment comparison analysis is based on a key assumption that in both cases – use of WECM (Scenario 2 and 3) or not use of WECM (Scenario 1) – the project facility would be the same: in fact, as confirmed by the PFS of the project facility /20/, coke batteries of the heat recovery type were selected for the project facility since they are more suitable – compared to the by-product type – for the use of the Semi Soft Coking Coal (SSCC) available at the Grootegeluk Coal Mine. The fact that coke batteries of the heat recovery type have a lower operating cost and investment cost, compared to the by-product type, is only a secondary effect of the choice. The technical reasons for the adoption of coke batteries of the heat recovery type proposed by the different suppliers have been confirmed by the independent engineering consulting company in charge of the preparation of the PFS /21/.

The technical choice of the plant represent the basis for the investment comparison analysis presented in the PDD and validated in the validation report: as it has been demonstrated that the basis plant would be the same (coke batteries of the heat recovery type), it is acceptable to consider that the capital and operating costs of the project facility in both cases – use of WECM (Scenario 2 and 3) or not use of WECM (Scenario 1) –will be the same.

For Scenario 1, the tariff rate is the rate that the project owner currently purchases power from the South African grid. The operation period is 20 years, the discount rate is 11.9% (default value for the expected return on equity of mining/mineral production (Group 2) in South

Africa provided by the Guidelines on the assessment of investment analysis /68/) and the income tax rate is 28%.

For Scenario 2, the input values are based on those used in the IRR calculation and validated in section 4.9.3 of this validation report. In this scenario the WHR plant configuration consists in two modules of two WHR boilers and one steam turbine each, having a total of four WHR boilers and two 30 MW steam turbines.

For Scenario 3, it is considered a WHR plant configuration with the same equipment installed in Scenario 2, but with only one module of two WHR boilers and one 30 MW steam turbine with relevant auxiliaries. In this configuration, the installed generation capacity of Scenario 3 would be half of the capacity of Scenario 2. The project participant therefore considered the CAPEX and the OPEX to be halved compared to Scenario 2. This choice is conservative, since it is expected that a larger project would benefit of the economy of scale and therefore the cost per installed kW in Scenario 3 should be higher than in Scenario 2. This consideration applies also to the OPEX, being a function of the CAPEX and of the electricity generated. Furthermore, considering that:

- the plant configuration consists in one module of two WHR boilers and one 30 MW steam turbine;
- 50% of the available WECM is used for power generation and the rest is combusted (flared) and vented to the atmosphere;
- The plant load factor is equal to 96%, i.e. equal to the plant load factor of Scenario 2;

the electricity generated in Scenario 3 is 50% of the electricity generated in Scenario 2. For comparison purposes, the remaining 50% of electricity is assumed to be supplied from the national grid.

As anticipated here above, the project participant carried out a levelised cost analysis and an investment comparison analysis /2/, adopting an after-tax equity IRR as financial indicator. Results are presented in the following table:

Scenario	**Levelised cost (inc. tax) ZAR/MWh**	**Levelised cost (exc. tax) ZAR/MWh**	**Equity IRR after tax, no CERs**
1. No use of WECM, power purchased from the grid	407.74	566.3	N.A. as there is no investment
2. All WECM used for power generation	412.43	643.82	7.39%
3. 50% usage of WECM for power generation, 50% power purchased from the grid	410.09	605.06	7.39%

The levelised cost analysis shows that Scenario 1 is more attractive than Scenarios 2 and 3, i.e. no usage of WECM and purchase of equivalent amount of power from the grid /2/. This option also represents significantly less risk for the project owner as the proposed project is not common practice in South Africa.

The investment comparison analysis shows that both the usage of WECM through the project activity (Scenario 2) and through an alternative design (Scenario 3) have an IRR equal to 7.39% /2/.

The results of the comparison show that Scenario 1 is more attractive than Scenarios 2, which is again more attractive than Scenario 3.

Therefore the project participant demonstrated that the alternative design of Scenario 1 (project facility with no usage of WECM) would have been the baseline scenario for the waste energy generated in the Greenfield facility.

Since the procedure carried out above concludes that no waste energy would have been utilised in the project facility, the value of factor "$f_{practice}$", is $f_{practice} = 0$.

The selected baseline, i.e. the combination of alternatives W2 and P10 described in the methodology /61/, confirms the applicability of the methodology /61/.

The assessment of the project's compliance with the applicability criteria of ACM0012 (version 04.0.0) are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

DNV has concluded that the application of the baseline methodology ACM0012 (version 04.0.0) /61/ is transparent and conservative.

4.6 Project boundary

According to the methodology ACM0012 (version 04.0.0) /61/, the geographical extent project boundary shall include the relevant WECM stream(s), equipment and energy distribution system in the project facility and in the recipient facility.

The project boundary includes the proposed project facility, containing the coke ovens where the coke oven flue gas is generated and the associated and co-located project activity containing the gas system, waste heat recovery boilers, steam system with turbines, generators, switchgear, control systems and ancillary equipment.

According to the methodology /61/, the spatial extent of the grid is as defined in the Tool to calculate the emission factor for an electricity system /63/.

As per the PDD, the South African national electricity grid operated by Eskom which supplies the electricity to the Grootegeluk Coal Mine, also forms part of the project boundary for the purposes of determining the baseline and grid emissions factor (GEF).

The project's system boundaries are clearly defined and in accordance with the methodology /61/.

The system boundaries are represented in the following table:

	GHGs involved	Description
Baseline emissions	CO_2	Electricity generation, grid or

		captive source
Project emissions	CO_2	Supplemental electricity consumption
Leakage	No sources of leakage emissions are considered in the methodology /61/.	

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 ACM0012 (version 04.0.0).

4.7 Baseline scenario identification and description

According to the methodology ACM0012 (version 04.0.0) /61/, the baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s).

Realistic and credible alternatives should be determined for:

- Waste energy use in the absence of the project activity;
- Power generation in the absence of the project activity for each recipient facility if the project activity involves electricity generation for that recipient facility;
- Heat generation (process heat and/or heat of reaction) in the absence of the project activity, for each recipient facility if the project activity involves generation of useful heat for that recipient facility; and
- Mechanical energy generation in the absence of the project activity, for each recipient facility if the project activity involves generation of useful mechanical energy for that recipient facility.

As required by step 1 of the baseline methodology procedure described in the methodology /61/, the project participant determined realistic and credible alternatives for:

- Waste energy use in the absence of the project activity; and
- Power generation in the absence of the project activity for each recipient facility if the project activity involves electricity generation for that recipient facility.

Since the project activity does not generate heat (process heat and/or heat of reaction) or mechanical energy as outputs, realistic and credible alternatives have not been identified for these.

For the use of waste energy the realistic and credible alternative(s) may include, *inter alia*:

Alternative	Description of the alternative	Assessment
W1	WECM is directly vented to the atmosphere without incineration;	According to the National Environment Management: Air quality act (2004) /32/, the waste gas generated in the ovens of market coke

		plant would need to be combusted prior to release it to the atmosphere. Therefore W1 is not a realistic and credible alternative.
W2	WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized;	According to the National Environment Management: Air quality act (2004) /32/, the waste gas generated in the ovens of market coke plant would need to be combusted prior to release it to the atmosphere. Therefore W2 is a realistic and credible alternative.
W3	Waste energy is sold as an energy source;	As verified during the site visit /82//83/, in the proximity of the plant there are no potential users/buyers of waste energy. Therefore W3 is not a realistic and credible alternative.
W4	Waste energy is used for meeting energy demand at the recipient facility(ies);	As confirmed by a letter signed by Grootegeluk Coal Mine manager /15/ and verified during the site visit /82/, Grootegeluk Coal Mine currently produces various types of coal which is supplied to the local and international markets. The pit is an open cast operation and uses the typical shovel and truck method of mining. Once the coal is mined, dependent on the type of coal, it is washed at one of 6 beneficiation plants situated on the site. These plants are typical cyclone equipped plants. None of the above operations have the potential to utilise the waste heat, partially or in full, generated by the proposed Market Coke Plant and therefore the waste heat from the coke ovens would remain unutilised. Moreover as confirmed by a letter signed by Reductants Business Unit Manager of Exarro Resources Limited (Exxaro) /16/ and verified during the site visit /82/, the char plant situated at Grootegeluk Coal Mine does not have the potential to utilise the waste heat, partially or in full, generated by the proposed

		Market Coke Plant and therefore the waste heat from the coke ovens would remain unutilised. Therefore alternative W4 is not a realistic and credible alternative.
W5	A portion of the quantity or energy of WECM is recovered for generation of heat and/or electricity and/or mechanical energy, while the rest of the waste energy produced at the project facility is flared/released to atmosphere/ unutilised;	The project participant provided the Grootegeluk annual GWh forecast /17/, showing the past, the present as well as the future electricity consumption of the Grootegeluk mine. Considering that the electricity consumption is expected to grow significantly in the next five years, recovering only a portion of the energy of the WECM is not considered a reasonable option, because it would increase the need of electricity importation from the national grid to satisfy the energy needs of the recipient facility. Moreover even if all the waste to produce electricity is recovered the project is still not feasible, as shown in the section 4.9.3 (Investment analysis) of this report. Therefore alternative W5 is not a realistic and credible alternative.
W6	All the waste energy produced at the facility is captured and used for export electricity generation or steam.	Alternative W6 is not a realistic and credible alternative since: • exportation of electricity generation would involve a project similar to the proposed project activity, which is not financially attractive, as further described in section 4.9.3 (Investment analysis) of this report • exportation of steam is not realistic, since the recipient facility is not requiring any additional thermal energy (as discussed in alternative W4) and, as verified during the site visit, there are no other facilities outside the

		Grootegeluk Coal Mine that could use the exported steam.

For power generation the realistic and credible alternative(s) may include, *inter alia*:

Alternative	Description of the alternative	Assessment
P1	Proposed project activity not undertaken as a CDM project activity;	As further detailed in section 4.9.3 (Investment analysis) of this report, CERs revenues are a key income stream for a feasible implementation of the proposed project activity. Therefore alternative P1 is not a realistic and credible alternative.
P2	On-site or off-site existing fossil fuel fired cogeneration plant;	As verified during the site visit /82//83/, there are no on-site or off-site existing fossil fuel fired cogeneration plants. Therefore alternative P2 is not a realistic and credible alternative.
P3	On-site or off-site Greenfield fossil fuel fired cogeneration plant;	As described in the PFS /5/ and in the environmental scoping report /6/, the project activity generates electricity only. Moreover as confirmed by a letter signed by Grootegeluk Coal Mine manager /15/ and verified during the site visit /82/, the existing operations of Grootegeluk Coal Mine does not need the heat that would be generated in an on-site or off-site Greenfield fossil fuel fired cogeneration plant. Therefore alternative P3 is not a realistic and credible alternative.
P4	On-site or off-site existing renewable energy based cogeneration plant;	As verified during the site visit /82//83/, there are no on-site or off-site existing renewable energy based cogeneration plants. Therefore alternative P4 is not a realistic and credible alternative.
P5	On-site or off-site Greenfield renewable energy based cogeneration plant;	As described in the PFS /5/ and in the environmental scoping report /6/, the project activity generates electricity only. Moreover as confirmed by a letter signed by Grootegeluk Coal Mine manager /15/ and verified during the site visit /82/, the existing

		operations of Grootegeluk Coal Mine does not need the heat that would be generated in an on-site or off-site Greenfield renewable energy based cogeneration plant. Therefore alternative P5 is not a realistic and credible alternative.
P6	On-site or off-site existing fossil fuel based existing identified captive power plant;	As described in the PFS /5/ and in the environmental scoping report /6/, power is currently supplied by the national grid. As verified during the site visit, there are no on-site or off-site existing fossil fuel based existing identified captive power plants. Therefore alternative P6 is not a realistic and credible alternative.
P7	On-site or off-site existing identified renewable energy or other waste energy based captive power plant;	As described in the PFS /5/ and in the environmental scoping report /6/, power is currently supplied by the national grid. As verified during the site visit, there are no existing identified renewable energy or other waste energy based captive power plants. Therefore alternative P7 is not a realistic and credible alternative.
P8	On-site or off-site Greenfield fossil fuel based captive plant;	As described in the PFS /5/ and in the environmental scoping report /6/, power is currently supplied by the national grid. The project activity will be located at the Grootegeluk Coal Mine, where an on-site greenfield coal fired captive power plant could be constructed. Therefore alternative P8 is a realistic and credible alternative.
P9	On-site or off-site Greenfield renewable energy or other waste energy based captive plant;	Approximately 93% of electricity supply in South Africa is generated with coal-fired power stations /45/. Considering this current practice, the construction of an on-site or off-site Greenfield renewable energy or other waste energy based captive plant is highly improbable. Therefore alternative P9 is not a

		realistic and credible alternative.
P10	Sourced from grid-connected power plants;	As described in the PFS /5/ and in the environmental scoping report /6/, power is currently supplied by the national grid. Alternative P10 represents the current practice, therefore alternative P10 is a realistic and credible alternative.
P11	Existing captive electricity generation using waste energy (if the project activity is captive generation using waste energy, this scenario represents captive generation with lower efficiency or lower recovery than the project activity);	As verified during the site visit /82//83/, there is no existing captive electricity generation using waste energy. Therefore alternative P11 is not a realistic and credible alternative.
P12	Existing cogeneration using waste energy, but at a lower efficiency or lower recovery.	As verified during the site visit, there is no existing cogeneration using waste energy Therefore alternative P12 is not a realistic and credible alternative.

The analysis made by the project participant with regards to step 1 of the methodology ACM0012 (version 04.0.0) /61/ revealed two realistic and credible scenarios, namely:

- Scenario 1: Waste energy would be combusted and vented (W2) and power would be supplied from a newly constructed Greenfield coal fired power plant (P8).
- Scenario 2: Waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10).

As required by step 2 of the methodology /61/, the project participant identified the most plausible baseline scenario by eliminating non-feasible options.

While scenario 1 involves an investment, scenario 2 does not require any investment, in accordance with paragraph 19 of Guidelines on the assessment of investment analysis /68/.

The project participant carried out a simple cost analysis adopting as financial indicator the Levelised Cost of Electricity (LCOE). The adopted benchmark is the average annual Eskom tariff for 2011 (48.82 ZARc/kWh).
The average annual Eskom tariff for 2011 has been calculated in the Electricity Tariff Calculation spread-sheet /4/, which has been verified by DNV to be correct in accordance with the evidence provided. The input data have been crosschecked with the electricity bill monthly issued by Eskom to Exxaro Resources Limited (Exxaro) during 2011 /9/.
The Levelised Cost of Electricity (LCOE) of a greenfield coal fired captive power plant with a capacity of 60 MW is 155.36 ZARc/kWh. The value has been crosschecked with an independent study (Levelised Cost of Electricity – Lephalale Power Plant /8/) based on the

result of a Coal fired steam power generation plant comparative cost estimate for a 60MWe plan at Lephalale (Grootegeluk) prepared by an independent third party /7/.

In conclusion Scenario 1, which is the combination of waste energy use alternative W2 and power generation alternative P8 is not a plausible scenario to the project activity, since it has been demonstrated that it is a non-feasible option. Indeed it is clearly economically unattractive compared to scenario 2: Waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10).

The baseline scenario is the combination of alternative W2 for the use of waste energy – WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized – and P10 for power generation – Sourced from grid-connected power plants.

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

4.8 Algorithms and/or formulae used to determine emission reductions

4.8.1 Baseline emissions

According to the methodology ACM0012 (version 04.0.0) /61/ baseline emissions for baseline scenario 1 and 2 are calculated as follows:

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y}$$

Where:

- $BE_{Elec,y}$ are the baseline emissions from electricity during the year y in tCO_2
- $BE_{Ther,y}$ are the baseline emissions from thermal energy (due to heat generation by elemental processes) during the year y (tCO_2)

The project activity produces only electricity, therefore:

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

Thus the baseline emissions are:

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

Since the proposed project activity consists in the recovery of waste heat for electricity generation /5/, the baseline emissions are relevant to electricity generation (paragraph 1.1.1

(a) of the methodology /61/) and Case 1 (Waste energy is used to generate electricity), as described in the methodology /61/, applies. Therefore:

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

Where:

- $BE_{Elec,y}$ are the baseline emissions due to displacement of electricity during the year y
- $EG_{i,j,y}$ is the quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y
- $EF_{elec,i,j,y}$ is the CO_2 emission factor for the electricity source i (gr for the grid, and is for an identified source), displaced due to the project activity, during the year y
- f_{wcm} is the fraction of total electricity generated by the project activity using waste energy. It is equal to 1 since all the electricity generated by the project activity is obtained from the use of waste energy.
- f_{cap} is the factor that determines the energy that would have been produced in project year y using waste energy generated at a historical level, expressed as a fraction of the total energy produced using waste source in year y. It is equal to 1 since the facility is Greenfield.

$EF_{elec,i,j,y}$ has been calculated according to the Tool to calculate the emission factor for an electricity system, Version 2.2.1 /63/ following six steps:

STEP 1: Identify the relevant electricity systems

The electric power system has been defined as the South African National grid.

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)

The project participant chose to calculate the operating margin and build margin emission factor following:

Option I: Only grid power plants are included in the calculation.

STEP 3: Select a method to determine the operating margin (OM)

The project participant chose to calculate the operating margin emission factor ($EF_{grid,OM,y}$) following the method:

(a) Simple Operating Margin

According to the Tool to calculate the emission factor for an electricity system /63/, the simple OM method (Option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The project participant chose to determine the emissions factor using the data vintage:

Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the

DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation.

As a consequence, the operating margin emission factor is calculated ex-ante and will remain fixed during the first crediting period.

STEP 4: Calculate the operating margin emission factor according to the selected method
Option A1 has been selected, where the emission factor of each power unit is calculated based on the net electricity generation and a CO_2 emission factor of each power unit. The emission factor of each power unit is calculated based on the amount of fuel consumed, fuel NCV, fuel emission factor, and electricity generation. The sources of the calculations are public available data elaborated by the grid owner (Eskom Holding Limited) for the years 2008/09, 2009/10, 2010/11 /42//44//45/ and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories /76/.
The operating margin emission factor has been calculated to be 0.92 tCO_2/MWh.

STEP 5: Calculate the build margin (BM) emission factor
The sample group of power units m used to calculate the build margin has been determined as per the procedure described in the tool. Since all most recent power units have more than 10 years and there are no units registered with the CDM, $SET_{\geq 20\%}$ including Majuba and Kendal has been used to calculate the build margin. The sources of the calculations are public available data elaborated by the grid owner (Eskom Holding Limited) for the years 2010/11 /42//44//45/ and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories /76/.
The build margin emission factor has been calculated to be 0.87 tCO_2/MWh.

STEP 6: Calculate the combined margin emissions factor
The combined margin has been calculated based on the weighted average approach. The weighting selected to calculate the combined margin is W_{OM} = 0.5 and W_{BM} = 0.5. This is in accordance with the tool since the project does not involve wind or solar power generation.
The combined grid emission factor has been calculated to be 0.90 tCO_2/MWh.

4.8.2 Project emissions

According to the methodology /61/, project emissions are calculated as follows:

$$PE_y = PE_{AF,y} + PE_{EL,y}$$

Where:

- PE_y are the project emissions due to the project activity
- $PE_{AF,y}$ are project activity emissions from on-site consumption of fossil fuels by the unit process(es) and/or co-generation plant(s) if they are used as supplementary fuels due to non-availability of waste energy to the project activity or due to any other reason
- $PE_{EL,y}$ are project activity emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption

In the case of the project activity, which will supply electricity to the Grootegeluk Coal Mine (the recipient facility) which includes the project facility and the project activity:

$$PE_{EL,y} = 0$$

because the only electricity consumption of the project activity /5/ is the gas cleaning equipment, which is consumed in the baseline scenario as well and therefore, according to the methodology /61/, can be ignored.
Moreover since in the project activity no fossil fuel will be used:

$$PE_{AF,y} = 0$$

Therefore:

$$PE_y = 0$$

4.8.3 Leakage emissions

No leakage is applicable under the methodology ACM0012 (version 04.0.0) /61/.

4.8.4 Emissions reductions

Emission reductions due to the project activity during the year y are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

- ER_y are the total emissions reductions during the year y;
- PE_y are the emissions from the project activity during the year y;
- BE_y are the baseline emissions for the project activity during the year y;

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 414 032tCO_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 Additionality

In accordance with methodology ACM0012 (version 04.0.0) /61/, the additionality of the project activity has been demonstrated and assessed using the latest version of the Tool for the demonstration and assessment of additionality /62/.

The project additionality is mainly based on investment analysis /2/.

4.9.1 Prior consideration of CDM

Project start date

The starting date of the proposed project activity is the expected construction contract signing date, which is expected to be 30 June 2013.

During the site visit the project participant confirmed that no commitment to expenditures related to the implementation or related to the construction of the project activity has been taken so far /82//83/. The above was confirmed also by the DNA /81/.
The starting date is therefore in accordance with the definition indicated in the Glossary of CDM terms /69/, since it is the earliest date at which either the implementation or construction or real action of a project activity will begin.

Evidence for prior consideration

The global stakeholder consultation took place between 28 January 2012 and 26 February 2012, i.e. prior to the starting date of the proposed project activity. Given this project timeline, the global stakeholder consultation is the evidence for prior consideration of CDM.

Real and continuing actions

Prior to the validation, the following activities were carried out:

- On 9 June 2011 Camco was appointed as CDM consultant /36/;
- On 27 June 2011 the Prior Consideration Notice was submitted to the CDM Executive Board (EB) /71/;
- On 28 June 2011 the DNA of South Africa notified the receipt of the Prior Consideration Notice /40/;
- On 6 September 2011 the project participant submitted the PIN to the DNA of South Africa /19/;
- On 28 September 2011 a Letter of No Objection was issued by the DNA of South Africa /37/;

The project participant submitted all the required evidence which were verified to be appropriate.

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.

4.9.2 Identification of alternatives to the project activity

According to sub-step 1a of the Tool for the demonstration and assessment of additionality /62/, the project participant identified the following alternatives:

- The proposed project activity undertaken without being registered as a CDM project activity;
- Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g., cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;
- If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

The proposed project activity undertaken without being registered as a CDM project activity is not financially viable, as further detailed in section 4.9.3 (Investment analysis) below.

Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario have been discussed in the section 4.7 (Baseline scenario identification and

description) of this report, where the project participant identified only one realistic and credible scenario, which is the continuation of the current situation (scenario 2).

As required by sub-step 1b of the of the Tool /62/, the project participant demonstrated that scenario 2, i.e. waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10) is in compliance with all mandatory applicable legal and regulatory requirements. As confirmed in the National Environment Management: Air quality act (2004) /32/, the waste gas generated in the ovens of market coke plant would need to be combusted and vented prior to release it to the atmosphere. As also confirmed by the DNA /81/, the baseline scenario is in accordance with all mandatory laws and regulations.

DNV considers the listed alternatives to be credible and complete.

4.9.3 Investment analysis

Choice of approach

The project activity generates revenues apart from CDM, indeed, as properly reflected in the PDD, the electricity generated by Market Coke WHR plant will replace the electricity that is currently purchased by the national grid.

The alternative to the project activity is the continuation of the current situation: waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10).

According to Guidelines on the assessment of investment analysis /68/, if the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate. Hence, as properly reflected in the PDD, the alternative to the project activity does not involve an investment.

The project participant carried out a benchmark analysis. Simple cost analysis was not the appropriate choice because the project activity generates revenues apart from CDM; investment comparison analysis was not the appropriate choice because the alternative to the project activity does not involve an investment.

The adopted financial indicator is an after-tax equity IRR.

Benchmark selection

The choice of the financial/economic indicator used in the investment analysis is in compliance with Annex 59 of EB 51: "Information note: previous rulings related to the appropriateness of benchmarks for project activities utilizing waste heat/waste gas for power generation" /70/. Even though the project activity occasionally could deliver some of the electricity to the South African grid, all the electricity generated by the project activity will be used for captive consumption /5/ and DNV confirms that the project participant adopted an after-tax equity benchmark related to the core business. Indeed the default value (11.9%) for the expected return on equity of mining/mineral production (Group 2) in South Africa provided by the Guidelines on the assessment of investment analysis /68/ has been defined as benchmark for the financial evaluation of the proposed project activity.

Therefore the adopted benchmark is appropriate and consistent with the adopted financial indicator (after-tax equity IRR).

Input parameters

At the time of the validation of the proposed project activity, no investment decision was taken yet. The project participant clarified that the investment decision to proceed with the implementation of the proposed project activity will be taken only after the eventual CDM registration, due to the need for the revenues from the sale of CERs to make the project activity more financially attractive.

DNV confirms that all input parameters are the latest available at the time of this validation.

All input parameter of the investment analysis have been verified to be in accordance with the evidence reviewed and verified to be the latest available at the time of this validation as follows:

- The plant load factor is equal to 96%. It has been sourced from the Prefeasibility Study Report /5/, prepared by and independent third party and dated 1 February 2011. The selected plant load factor complies with Guidelines for the reporting and validation of plant load factors /65/, since it was determined by a third party contracted by the project participant. DNV confirms that this value is the latest available at the time of this validation.
- The electricity tariff is equal to 0.5663 ZAR/kWh. It has been verified to be the average annual Eskom electricity tariff for 2011 (0.4882 ZAR/kWh) /9/ increased by the NERSA Review Eskom's Tariffs for the Period 1 April 2012 to 31 March 2013 (16%) /75/. The input data have been sourced from the electricity bill monthly issued by Eskom to Exxaro Resources Limited (Exxaro) during 2011 /9/.

  The electricity tariff has been calculated by the project participant in the Electricity Tariff Calculation spread-sheet /4/. The calculation /4/ has been verified by DNV to be correct in accordance with the evidence provided /9//75/.
- The NERSA Review Eskom's Tariffs for the Period 1 April 2012 to 31 March 2013, which has been applied to the average annual Eskom electricity tariff for 2011 (0.4882 ZAR/kWh), is equal to 16% increase. The NERSA Review Eskom's Tariffs factor of 16% is applied to both the electricity purchased from and sold to the South African grid. It has been sourced from the National Energy Regulator of South Africa (NERSA) review Eskom's tariffs for the period 1 April 2012 to 31 March 2013 /75/, published on 9 March 2012. DNV confirms that this value is the latest available at the time of this validation.
- The investment cost (hard CAPEX) is equal to 1 019 005 600 ZAR. It has been sourced from the estimate provided in the Prefeasibility Study Report /5/, based on quotations received from equipment manufacturers as well as the experience of an independent engineering company in building similar projects, and dated 1 February 2011.

  The hard CAPEX have the following breakdown:

  a. Waste Heat Recovery Boiler: 202 407 360 ZAR;
  b. Turbines: 395 575 620 ZAR;
  c. Cooling system: 1 647 185 ZAR;
  d. Demineralized water plant: 13 139 011 ZAR;
  e. Piping: 27 967 040 ZAR;
  f. Civil's and earthworks: 4 187 452 ZAR;
  g. Buildings: 68 840 939 ZAR;

h. Electrical works: 161 583 918 ZAR;
i. Utilities: 10 743 301 ZAR;
j. Contingency: 132 913 774 ZAR.

DNV confirms that this value is the latest available at the time of this validation.

As shown in section 4.9.5 of this validation report, there are no similar projects to the proposed project in South Africa: the 3 existing coke plants in South Africa use coke batteries with by product recovery technology. Therefore it is not possible to cross-check the CAPEX figures for the proposed project with other similar projects in South Africa. Further, the tendering and procurement process for the proposed project has not yet been completed and it is not possible therefore to cross-check the CAPEX figures in the Prefeasibility Study Report /5/ for the proposed project with actual contracts for equipment procured.

Some quotes received during the initial design stage of the proposed project activity from 2008-2010 has been assessed to crosscheck the hard CAPEX /46//47//48//49//50//51//52//53//54//56/. The quotes do not directly correspond to the categories in the Prefeasibility Study Report CAPEX table /5/, therefore it was possible to compare only the total amount of the quotes with the total hard CAPEX (1 019 005 600 ZAR). Such comparison reveals that the total amount of the quotes constitutes the 70% of the total hard CAPEX (excluding contingencies), however:

a. piping system and buildings are not covered by the quotes reviewed by DNV;
b. most of the quotes reviewed by DNV are not including the erection works, which can be conservatively estimated to be equal to 10% of the total hard CAPEX, according to DNV sectorial expertise;
c. the quotes reviewed by DNV were prepared during the period between 2008 and 2010, while the Prefeasibility Study Report was finalized only in 2011 /5/. For a proper comparison the total amount of the quotes should be at least conservatively escalated by the Consumer Price Index (5.10%) in South Africa /73/;

In conclusion the adopted figure for the hard CAPEX is in line with the quotes received during the initial design stage of the proposed project activity from 2008-2010 and reviewed by DNV /46//47//48//49//50//51//52//53//54//56/.

Moreover a further crosscheck has been performed: based on information from the US Department of Energy and from the Electric Power Research Institute /79/, the capital cost for a traditional steam cycle WHR system in the US where the source of waste heat is typically exhaust from gas turbines, reciprocating engines, incinerators, and furnaces, is ranging between 1 500 – 2 500 USD/kW. In the case of the proposed project activity the specific cost per kW – considering both hard and soft CAPEX – is 2 260 USD/kW, therefore within the abovementioned range. The comparison of the project activity investment cost with the US market reveals that the adopted figures are conservative, not only because they are within the suggested cost range, but also because in the case of the proposed project activity most of the equipment will be purchased abroad (while in the US the technology is available within the country), causing a high transportation cost to carry the equipment to the host country.

It must be noted that the comparison has been made not taking into account the contingencies, which are estimated to be equal to 15% of the investment cost and introduced to take into account the risk of the project for being at the prefeasibility

stage. This assumption is deemed appropriate since the values provided by the US Department of Energy are referring to an installed WHR system and figures are not taking into account the risk applicable to an earlier project implementation stage.

- The investment cost (soft CAPEX) is equal to 540 232 704 ZAR. It has been sourced from the estimate provided in the Prefeasibility Study Report /5/, based on quotations received from equipment manufacturers as well as the experience of an independent engineering company in building similar projects, and dated 1 February 2011.

  The soft CAPEX have the following breakdown:

  a. Sub-contractors Prelims & General: 132 309 270 ZAR;
  b. Transport costs: 57 293 470 ZAR;
  c. Vendor supervision: 2 173 500 ZAR;
  d. Engineering design and costs management: 161 680 210 ZAR;
  e. Disbursements and expenses: 16 168 021 ZAR;
  f. Consultants: 0 ZAR;
  g. Client costs: 84 197 409 ZAR;
  h. Construction insurance: 15 945 689 ZAR;
  i. Contingency: 70 465 135 ZAR.

  DNV confirms that this value is the latest available at the time of this validation.

  As explained in the hard CAPEX bullet point above, DNV crosschecked the soft CAPEX together with the hard CAPEX with public available sources of data and found them to be suitable and conservative /79/.

- The exchange rate is equal to 10.87 ZAR/EURO. It has been crosschecked with the selected historical exchange and interest rates for 2011 published by Resbank /78/. DNV confirms that this value is the latest available at the time of this validation.
- The % Equity is equal to 100%. The project participant clarified that at a "corporate" level, Exxaro have access to a "pool" of debt (30%) on its balance sheet that is applied across the group for use in financing projects /11/. Therefore, while the project activity assumes a 100% equity component, the equity does in fact include a targeted debt percentage at 30%. The project's ability to service the debt component of the equity is thus included.
- The water usage is equal to 0.2 litre/kWh. It has been sourced from the Operational expenditure budget for the Exarro Market Coke waste heat recovery project, prepared by a local engineering company /24/ and dated 29 May 2012. DNV confirms that this value is the latest available at the time of this validation.
- The fixed OPEX are equal to 69 million of ZAR. They have been sourced from the Operational expenditure budget for the Exarro Market Coke waste heat recovery project, prepared by a local engineering company /24/ and dated 29 May 2012.
  The fixed OPEX have the following breakdown:

  a. Operational insurance: 8 million of ZAR;
  b. General & administrative: 9 million of ZAR;
  c. Labour: 23 million of ZAR;
  d. Third party services: 13 million of ZAR;
  e. Sampling and assaying: 2.5 million of ZAR;
  f. Environmental monitoring: 2 million of ZAR;
  g. Contingency: 11.5 million of ZAR;

DNV confirms that this value is the latest available at the time of this validation.

As shown in section 4.9.5 of this validation report, there are no similar projects to the proposed project in South Africa: the 3 existing coke plants in South Africa use coke batteries with by product recovery technology. Therefore it is not possible to cross-check the OPEX figures for the proposed project with other similar projects in South Africa. Further, since the project is still at the prefeasibility stage, it is not possible to cross-check the OPEX figures in the Prefeasibility Study Report /5/ for the proposed project with actual costs of operation and maintenance.

A comparison was made therefore with the OPEX of registered Chinese WHR projects of a similar size (applicable output range) in the coke sector /72/. The applicable output range has been defined to be 30 MW to 90 MW, which correspond to ± 50% of the design capacity of the proposed project activity.

The other projects in the comparison are Chinese but the comparison between OPEX of Chinese projects and OPEX of South African projects are based on comparing the share of OPEX from the CAPEX value. This is found to be a relatively good way to compare given the lack of other projects in South Africa. The comparison shows that the proposed project has an O&M cost of 5% whereas the Chinese projects are in the range of 12-23%. This is a big difference and indicates that the OPEX of the proposed project is reasonable even if it was not possible to do a more precise comparison. Besides, in China there are more examples of use of WECM in the coke sector meaning that OPEX is likely to be lower.

The annual OPEX for the proposed project is 5.01% of CAPEX in years 1-3 and 5.13% of CAPEX in years 4-20. In the following table it can be seen that OPEX/ CAPEX ratio for other registered WHR projects of a similar size in the coke sector is in the range of 12-23% /72/. On this basis, the OPEX for the proposed project are deemed to be conservative.

It is important to note that, as shown in the sensitivity analysis, the total OPEX would need to be more than 100% lower than projected for the IRR to reach the benchmark, confirming the relatively low weight of this parameter in the demonstration of the additionality of the proposed project activity.

UNFCCC number	Project name	Installed capacity	CAPEX (RMB)	OPEX (RMB)	OPEX (% of CAPEX)
7310	Fugu County Moyuan Magnesium & Coal Industry Co., Ltd. Semi-coke Waste Gas Power Generation Project	30	193.874.000	24.180.000	12%
7308	Fugu County Yabo 30MW Semi-coke Waste Gas Power Generation Project	30	190.800.000	24.340.000	13%
7550	Fugu County Jingfu Coal Chemical Co., Ltd. 30MW Semi-coke Waste Gas Power Generation	30	194.814.800	24.775.600	13%
7309	Shenmu County Derun Carbonaceous Reductant Co., Ltd. Semi-coke Waste Gas Power Generation Project	60	372.933.600	49.660.000	13%
6152	Coke oven gas comprehensive utilization for co-generation project in Shandong Jikuang Morningsun Thermal Power Co., Ltd	42	352.891.700	82.014.014	23%
5369	Hebei Huafeng Coking Gas Recovery for Power Generation Project	30	126.930.100	27.598.516	22%
5473	Hebei Huafeng 1×30MW COG Power Generation Project	30	143.611.700	30.135.441	21%
4725	Shenmu County Tengyuan Coal Chemical Industry Co., Ltd. 60 MW Semi-coke Waste Gas for Power Generation Project	60	366.550.000	51.100.000	14%
4140	Shenmu County Hengsheng Coal Chemical Co., Ltd. 30MW Semi-coke Waste Gas Power Generation Project	30	185.162.800	22.106.100	12%
3500	Waste gas for power generation in Shenmu County Tongdeli Coal Chemical Industry Co., Ltd	30	184.093.700	22.066.500	12%

- Variable OPEX (Years 1-3) are equal to 9 192 960 ZAR. They have been verified to be in accordance with Operational expenditure budget for the Exarro Market Coke waste heat recovery project, prepared by a local engineering company /24/ and dated 29 May 2012. The variable OPEX and in particular the water cost is expected to grow from an initial value valid only for the first three years of operation. The increase of the water tariff was confirmed by the summary of a meeting held by Trans-Caledon Tunnel Authority (TCTA) for Eskom and Exxaro Resources Limited (Exxaro) regarding a multi-purpose project incorporating both economic and social development objectives to cater for a growing water demands in the Lephalale area /43/. For this reason the Variable OPEX has been split for the periods (Years 1-3) and (Years 4-20) as described here below.

  The variable OPEX (Years 1-3) have been calculated with the following input values:

  a. Operational and Maintenance (O&M) variable fee is equal to 4 ZAR/GJ;
  b. Water Cost (up to end 2016) is equal to 0.01 ZAR/litre; this value has been crosschecked with the summary of a meeting held by TCTA for Eskom and Exxaro Resources Limited (Exxaro) regarding a multi-purpose project incorporating both economic and social development objectives to cater for a growing water demands in the Lephalale area /43/.
  c. Contingency is equal to 20%; this value has been crosschecked with AACE International Recommended Practice No. 18R-97 – Cost estimate classification system – as applied in engineering, procurement, and construction for the process industries /77/. According to the evidence reviewed the range of applicable contingencies for a project in the pre-feasibility stage, like the proposed project activity, would be +20% to +50%. Therefore the adopted value equal to 20% is deemed by DNV applicable and conservative.

     Even if contingencies were not taken into account in the investment analysis, i.e. having lower CAPEX and OPEX, the calculated IRR (10.44%) would be lower than the adopted benchmark (11.9%).

  DNV confirms that this value is the latest available at the time of this validation.

  As explained in the fixed OPEX bullet point above, DNV crosschecked the variable OPEX together with the fixed OPEX with public available sources of data and found them to be suitable and conservative /72//80/.

- Variable OPEX (Years 4-20) are equal to 11 007 360 ZAR. They have been verified to be in accordance with Operational expenditure budget for the Exarro Market Coke waste heat recovery project, prepared by a local engineering company /24/ and dated 29 May 2012.

  The variable OPEX (Years 4-20) have been calculated with the following input values:

  a. Operational and Maintenance (O&M) variable fee is equal to 4 ZAR/GJ; this value has been calculated by Prana Energy in the document Maintenance cost estimate /26/ considering and O&M cost of 2.5% of the capital cost. The assumption is deemed reasonable according to DNV sectorial and local expertise.
  b. Water Cost (beginning 2017) is equal to 0.025 ZAR/litre; this value has been crosschecked with the summary of a meeting held by TCTA for Eskom and

Exxaro Resources Limited (Exxaro) regarding a multi-purpose project incorporating both economic and social development objectives to cater for a growing water demands in the Lephalale area /43/.

c. Contingency is equal to 20%.

DNV confirms that this value is the latest available at the time of this validation.

As explained in the fixed OPEX bullet point above, DNV crosschecked the variable OPEX together with the fixed OPEX with public available sources of data and found them to be suitable and conservative /72//80/.

- The company income tax rate is equal to 28%. It has been verified to be in accordance with the value published by the South African Revenue Service (SARS) on16 February 2010 /29/. DNV confirms that this value is the latest available at the time of this validation.
- The Value Added Tax (VAT) is equal to 14%. It has been verified to be in accordance with the values published by the South African Revenue Service (SARS) on 16 February 2010 /29/. DNV confirms that this value is the latest available at the time of this validation.
- Depreciation of Hard CAPEX for major equipment is equal to 40% of the investment cost for the first year and is equal to 20% of the investment cost for the subsequent three years. It has been verified to be in accordance with the document "Deduction in respect of assets used by manufacturers or hotelkeepers and in respect of aircraft and ships, and in respect of assets used for storage and packing of agricultural products" issued by SARS on 21 November 2011 /27/. Major equipment are considered to be in line with the definitions and prescriptions of "machinery or plant" under Section 12C of the Income Tax Act (Act No. 58 of 1962, as amended) /27/ and include the Waste Heat Recovery Boilers, Turbines, Cooling system and Demineralized water plant. DNV confirms that this value is the latest available at the time of this validation.
- Depreciation of Hard CAPEX for other equipment is equal to 5% of the investment cost yearly. It has been verified to be in accordance with the document "Deduction in respect of certain pipelines, transmission lines and railway lines" issued by SARS on 21 November 2011 /28/. Other equipment are considered being in line with the definitions and prescriptions of "affected asset" under Section 12D of the Income Tax Act (Act No. 58 of 1962, as amended) /28/ and include Piping, Civil's and earthworks, Electrical works and Utilities. DNV confirms that this value is the latest available at the time of this validation.

Calculation and conclusion

The IRR calculation /2/ was received and verified. DNV confirms that the financial calculations are correct and the underlying assumptions are appropriate; indeed according to the IRR calculation /2/, the WECM is considered to have zero values, since it would be wasted in the baseline scenario.

The income tax calculation takes depreciation into account. Depreciation has been added back to net profits for the purpose of calculating the after-tax equity IRR. Depreciation is in accordance with normal accounting practice in the host country /27//28/.

The period of the investment analysis coincides with the operating time of the project activity, which is 20 years.

The IRR calculation is taking into account a salvage value of 5% of the investment cost of the waste heat recovery boiler and of the turbines at the end of the investment period /2/. The adopted salvage value has been confirmed by a local engineering company /25/.

The calculated after-tax equity IRR of 7.39% is significantly below the adopted after-tax equity benchmark of 11.9%, showing that the proposed CDM project activity is not financially/economically attractive. This conclusion is further supported by the sensitivity analysis described in the paragraph here below.

Sensitivity analysis

The key parameters contributing to more than 20% of the revenue/costs during operating or implementation have been identified as follows:

- Hard and Soft CAPEX (Total CAPEX)
- Fixed and Variable OPEX (Total OPEX)
- Electricity tariff
- Electrical output

A sensitivity analysis was conducted and the key parameters have been varied to reach the benchmark and the likelihood of this to happen been justified to be small as follows:

- Total CAPEX: this parameter would need to be 26% lower than projected for the IRR to reach the benchmark. This is very unlikely since the projected total CAPEX is calculated based on quotations received from equipment manufacturers as well as the experience of an independent engineering company in building similar projects /5/. Considering the global trend on equipment costs, Total CAPEX is more likely to increase. Therefore a 26% reduction of the total CAPEX is highly improbable.
- Total OPEX: this parameter would need to be more than 100% lower than projected for the IRR to reach the benchmark. This is very unlikely since the projected total OPEX is calculated on the basis of an estimation done by experienced local engineering company /24/. A variation of such magnitude of the total OPEX is highly improbable
- Electrical tariff: this parameter would need to be 35% higher than projected for the IRR to reach the benchmark. This is very unlikely since the projected electrical tariff based upon the actual electricity tariff for the Grootegeluk Coal Mine for the period January 2011 to December 2011 /9/ which has been increased (16%) in line with NERSA approved tariff increases for the period 1 April 2012 to 31 March 2013 /75/. The adopted electrical tariff is already reflecting future increases, therefore a further increase of 35% is highly improbable.
- Electrical output: this parameter would need to be 36% higher than projected for the IRR to reach the benchmark. This is very unlikely since the projected electrical output has been calculated taking into account a plant load factor of 96% /5/, therefore an increase of 36% is technically impossible.

The sensitivity analysis shows that very unrealistic favourable circumstances would be required for the IRR to reach the benchmark, even when the possible variations of the main parameters are considered.

4.9.4 Barrier analysis

According to the Tool for the demonstration and assessment of additionality /62/, the project participant is entitled to choose whether to proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis).

The additionality is mainly based on the investment analysis and the project activity does not apply a barrier analysis.

4.9.5 Common practice analysis

According to the Tool for the demonstration and assessment of additionality /62/, the geographical scope of the common practice analysis has been defined as the entire host country (South Africa) as a default.

According to the Tool for the demonstration and assessment of additionality /62/, for project activities that involve switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies), a stepwise procedure has to be used to carry out the common practice analysis.

In accordance with the tool /62/, the common practice analysis has been carried out following the stepwise procedure described here below:

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

As per the Pre-Feasibility Study Report, the design capacity of steam turbine generators installed in the waste heat recovery plant is 2x30 MW /5/. The applicable output range has been defined to be 30 MW to 90 MW, which correspond to ± 50% of the design capacity of the proposed project activity, as specified in the Pre-Feasibility Study Report /5/.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step.

The project participant carried out the common practice analysis covering the entire host country (South Africa). According to a sectorial expert opinion /41/, and confirmed by the DNA /81/, in South Africa there are only 3 coke manufacturing plants. These include plants located at:

- Vanderbijlpark – 6 coke batteries with gas cleaning and by-product recovery;
- Pretoria – 1 coke battery with gas cleaning and by-product recovery;
- Newcastle – 3 coke batteries with gas cleaning and by-product recovery.

Therefore $N_{all} = 3$.

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

Among the identified coke manufacturing plants, none of them has coke batteries of the heat recovery type. Indeed the three existing coke plants are using coke batteries with the by

product recovery technology. Therefore all 3 plants apply technologies different that the technology applied in the proposed project activity.

Therefore $N_{diff} = 3$.

Step 4: Calculate factor $F = 1 - N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

In the case of the proposed project activity: $F = 1 – 3/3 = 0$

The proposed project activity is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled:

(a) the factor F is greater than 0.2, and

(b) N_{all}-N_{diff} is greater than 3.

In the case of the proposed project activity:

(a) $F = 0$

(b) $N_{all}-N_{diff} = 0$

Therefore the proposed project activity is not a "common practice" within the coal sector in South Africa.

The common practice analysis has been correctly conducted according to the provisions of the Tool for the demonstration and assessment of additionality /62/.

4.9.6 Additionality - Conclusion

DNV is able to confirm the relevance of the presented arguments and the project's additionality, i.e. its ability to reduce anthropogenic emissions of greenhouse gases by sources below those that would have occurred in the absence of the registered CDM project activity.

In conclusion, it is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions resulting from the project are additional.

4.10 Monitoring plan

The monitoring plan is mainly focused on the monitoring of the quantity of electricity supplied to the Grootegeluk Coal Mine and occasionally to the South African grid by the Waste Heat Recovery plant, which in the absence of the project activity would have been sourced from sourced from the grid.

Main and backup electricity meters will be installed on the feeds of the recipient plant.

Therefore the monitoring arrangements described in the monitoring plan are feasible within the project design.

The project monitoring plan is in compliance with the monitoring methodology ACM0012 (version 04.0.0) /61/.

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

4.10.1 Parameters determined ex-ante

The following parameter has been determined ex-ante:

- CO_2 emission factor for the electricity source i, displaced due to the project activity, during the year y (**$EF_{elec,i,j,y}$**). It is equal to 0.983 tCO_2/MWh and it has been obtained following the Tool to calculate the emission factor for an electricity system /63/. The calculations provided in the spreadsheet Grid Emission Factor and Emission Reduction calculation /3/ were found correct and supported by proper evidence /42//44//45//76/.

4.10.2 Parameters monitored ex-post

The following parameters will be monitored ex-post:

- The quantity of electricity supplied to the recipient j (Grootegeluk Coal Mine and the South African national grid) by generator (the project activity), which in the absence of the project activity would have been sourced from source i (the South African grid) during the year y (**$EG_{i,j,y}$**). It will be measured continuously using electricity meters. The electricity meters will be calibrated and maintained according to the manufacturer's specifications. The meter readings will be aggregated monthly for use in the monitoring report. The information will be monthly saved onto Exxaro's Supervisory Control and Data Acquisition (SCADA) system. The ex-ante estimation of this parameter is equal to 462 000 MWh and it has been obtained considering a net installed capacity of 55 MW and a plant load factor of 96%, as per the prefeasibility study report /5/.
- Abnormal operation of the project facility including emergencies and shut down in the list of parameters to be monitored. This parameter has to be monitored to demonstrate that no emission reduction is claimed for the hours during the abnormal operation of the part of project facility which have impact on waste energy generation and recovery. The abnormality can be in terms of violation of operational parameters, poor quality product, emergencies or shutdown. The operational parameters to be monitored at this regard will be:
    a. High COFG temperature: Temperature measurement after tertiary combustion
    b. Low COFG temperature: Temperature measurement after tertiary combustion
    c. Low COFG flow: COFG pressure at WHRB inlet and ID fan speed at the WHRB outlet

  This parameter will be monitored daily and aggregated annually, as required by the methodology ACM0012 (version 04.0.0) /61/. The information will be saved onto Exxaro's Supervisory Control and Data Acquisition (SCADA) system.

The monitoring methodology ACM0012 (version 04.0.0) /61/ is listing several data and parameters to be monitored, however they are not applicable to the proposed project activity for the following reasons:

- Fraction of total heat that is used by the recipient *j* in the project that in absence of the project activity would have been supplied by the i^{th} element process (**$ws_{i,,j}$**). This parameter is used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of

the project activity the waste energy is used to generate electricity, therefore this parameter is not applicable.

- Quantity of WECM/Waste gas used for energy generation during year *y* (**$Q_{WCM,y}$/$Q_{WG,y}$**). This parameter is used to calculate f_{cap}. However for greenfield projects, like the proposed project activity, f_{cap} is fixed and equal to 1, therefore this parameter is not applicable.
- CO_2 emission factor per unit of energy of the fossil fuel used in the baseline generation source *i* (*i*=is) providing energy to recipient *j* (**$EF_{CO2,is,j}$**). This parameter has to be monitored when waste energy is used to provide mechanical energy that would have been supplied by an electrical motor in the baseline. However in the case of the project activity the waste energy is used to generate electricity, therefore this parameter is not applicable.
- CO_2 emission factor per unit of energy of the fossil fuel used in the reference baseline generation source *i* (*i*=rs) providing energy to recipient *j* (**$EF_{CO2,rs,j}$**). This parameter has to be monitored when waste energy is used to provide mechanical energy that would have been supplied by an electrical motor in the baseline. However in the case of the project activity the waste energy is used to generate electricity, therefore this parameter is not applicable.
- CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline cogeneration plant (**$EF_{CO2,COGEN}$**). This parameter is used in the calculation of the baseline emissions from co-generated electricity and heat of a cogeneration plant. However in the case of the project activity the cogeneration is not a realistic and credible baseline scenario, therefore this parameter is not applicable.
- Quantity of electricity supplied to the recipient facility *j* by the project activity during the year *y* in MWh (**$EG_{j,y}$**). This parameter is used in the calculation of the baseline emissions from co-generated electricity and heat of a cogeneration plant. However in the case of the project activity the cogeneration is not a realistic and credible baseline scenario, therefore this parameter is not applicable.
- Fraction of total electricity generated by the project activity, that is supplied to recipient *j* in year *y (***$F_{j,y}$***)*. This parameter is used in the calculation of the baseline emissions when there is partial recovery of the WECM stream(s) in the baseline scenario. However in the case of the project activity partial recovery of the WECM stream(s) is not a realistic and credible baseline scenario, therefore this parameter is not applicable.
- Net quantity of heat supplied to the recipient facility *j* by the project activity during the year *y* in TJ (**$HG_{j,y}$**). This parameter is used in the calculation of the baseline emissions from co-generated electricity and heat of a cogeneration plant. However in the case of the project activity the cogeneration is not a realistic and credible baseline scenario, therefore this parameter is not applicable.
- Mechanical energy generated by the steam turbine in the project activity and supplied to the mechanical equipment (e.g. pump, compressor) of recipient *j*, which in the absence of the project activity would be driven by electric motor *i* or steam turbine *k* (**$MG_{i,j,y,mot}$** (and **$MG_{j,y,mot}$**) or **$MG_{k,j,y,tur}$** (and **$MG_{j,y,tur}$**)). These parameters have to be monitored when waste energy is used to provide mechanical energy that would have been supplied by an electrical motor in the baseline. However in the case of the project

activity the waste energy is used to generate electricity, therefore these parameters are not applicable. Moreover these parameters are used in the calculation of the baseline emissions when there is partial recovery of the WECM stream(s) in the baseline scenario. However in the case of the project activity partial recovery of the WECM stream(s) is not a realistic and credible baseline scenario, therefore these parameters are not applicable.

- CO_2 emission factor per unit of energy of the baseline fuel used in i^{th} element process used by recipient *j*, in tCO_2/TJ, in absence of the project activity (**$EF_{CO2,i,j}$**). This parameter is used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of the project activity the waste energy is used to generate electricity, therefore this parameter is not applicable.
- Fraction of total heat that is used by the recipient *j* in the project that in absence of the project activity would have been supplied by the i^{th} element process (**$ws_{i,j}$**). This parameter is used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of the project activity the waste energy is used to generate electricity, therefore this parameter is not applicable.
- CO_2 emission factor of fossil fuel (tCO_2/TJ) that would have been used at facility *j* for flaring the waste gas (**$EF_{CO2,j}$**). This parameter is used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of the project activity the waste energy is used to generate electricity, therefore this parameter is not applicable.
- Amount of individual fuel (and other fuel(s)) *i* consumed at the energy generation unit/or unit process *n* during hour *h* (**$Q_{i,h}$** or **$Q_{i,n,h}$**). These parameters are used to calculate the fraction f_{wcm} of energy produced by the project activity, however in the case of the proposed project activity f_{wcm} is equal to 1 since all the electricity generated by the project activity is obtained from the use of waste energy. Moreover the project is not generating mechanical energy or useful heat. Therefore these parameters are not applicable.
- Amount of individual fuel (WECM and other fuel(s)) *i* consumed at the energy generation unit or unit process *n* during hour *h* (**$Q_{wcm,h}$** or **$Q_{wcm,n,h}$**). These parameters are used to calculate the fraction f_{wcm} of energy produced by the project activity, however in the case of the proposed project activity f_{wcm} is equal to 1 since all the electricity generated by the project activity is obtained from the use of waste energy. Moreover the project is not generating mechanical energy or useful heat. Therefore these parameters are not applicable.
- Net Calorific Value annual average for each individual consumed fuel and/or WECM (**NCV_i or $NCV_{WCM,y}$**). These parameters are used to calculate the fraction f_{wcm} of energy produced by the project activity, however in the case of the proposed project activity f_{wcm} is equal to 1 since all the electricity generated by the project activity is obtained from the use of waste energy. Moreover the project is not generating mechanical energy or useful heat. Therefore these parameters are not applicable.
- Specific Heat of WECM or fuel (**Cp_{wcm} or CP_i**). These parameters are used to calculate the fraction f_{wcm} of energy produced by the project activity, however in the case of the proposed project activity f_{wcm} is equal to 1 since all the electricity

generated by the project activity is obtained from the use of waste energy. Moreover the project is not generating mechanical energy or useful heat. Therefore these parameters are not applicable.

- Specific Heat of product *p* of product mix or reactant *r* of reactant mix to an unit process *n* (**Cp_p** or **Cp_r**). These parameters are used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of the project activity the waste energy is used to generate electricity, therefore these parameters are not applicable.
- The temperature of WECM (or fuel) in hour *h* (**$t_{wcm,h}$** or **$t_{i,h}$**). These parameters are used to calculate the fraction f_{wcm} of energy produced by the project activity, however in the case of the proposed project activity f_{wcm} is equal to 1 since all the electricity generated by the project activity is obtained from the use of waste energy. Moreover the project is not generating mechanical energy or useful heat. Therefore these parameters are not applicable.
- Temperature of the product mix at the outlet of the process/reactor *j* (^oC) and Temperature of the reactant mix at the inlet of the process/reactor *j* (^oC) (**t_o** and **t_i**). These parameters are used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of the project activity the waste energy is used to generate electricity, therefore these parameters are not applicable.
- The total quantity of electricity generated from the identified WECM stream(s) during the year *y* (**$EG_{PJ,y}$**). This parameter is used in the calculation of the baseline emissions when there is partial recovery of the WECM stream(s) in the baseline scenario. However in the case of the project activity partial recovery of the WECM stream(s) is not a realistic and credible baseline scenario, therefore this parameter is not applicable.
- The total quantity of mechanical energy supplied by steam turbine operated by steam generated using waste energy of identified WECM stream(s) (in terms of TJ in the year *y*) (**$MG_{PJ,j,y}$**). This parameter is used in the calculation of the baseline emissions when there is partial recovery of the WECM stream(s) in the baseline scenario. However in the case of the project activity partial recovery of the WECM stream(s) is not a realistic and credible baseline scenario, therefore this parameter is not applicable.
- Net quantity of heat (enthalpy) supplied to the element process/unit process/reactor *n* (only for process heating and not for heat of reaction) in recipient facility *j* during the year *y* from the identified WECM stream(s) (**$HG_{PJ,n,j\ y}$**). This parameter is used in the calculation of the baseline emissions when there is partial recovery of the WECM stream(s) in the baseline scenario. However in the case of the project activity partial recovery of the WECM stream(s) is not a realistic and credible baseline scenario, therefore this parameter is not applicable.
- Energy supplied, using WECM stream(s), as heat for process and/or as a heat of reaction to chemical reaction, in project year *y* (**$H_{wcm,y}$**). In the case of the project activity the waste energy is used to generate electricity and not heat for process and/or heat of reaction to chemical reaction, therefore this parameter is not applicable.
- Average temperature of Waste Energy Carrying Medium (WECM) in year *y* (**$t_{wcm,y}$**). This parameter is used to calculate f_{cap}. However for greenfield projects, like the

proposed project activity, f_{cap} is fixed and equal to 1, therefore this parameter is not applicable.

- Average pressure of WECM in year *y* (**$P_{WCM,y}$**). This parameter is used to calculate f_{cap}. However for greenfield projects, like the proposed project activity, f_{cap} is fixed and equal to 1, therefore this parameter is not applicable.
- Average enthalpy of WECM in year *y* (**$H_{WCM,y}$**). This parameter is used to calculate f_{cap}. However for greenfield projects, like the proposed project activity, f_{cap} is fixed and equal to 1, therefore this parameter is not applicable.
- Average density of WECM at actual temperature and pressure in year *y* (**$d_{wcm,y}$**). This parameter is used to calculate f_{cap}. However for greenfield projects, like the proposed project activity, f_{cap} is fixed and equal to 1, therefore this parameter is not applicable.
- Quantity of actual output/intermediate energy generated during year *y* (**$Q_{OE,y}$**). This parameter is used to calculate f_{cap}. However for greenfield projects, like the proposed project activity, f_{cap} is fixed and equal to 1, therefore this parameter is not applicable.
- Quantity of product *p* in the product mix at the outlet of the process (or reactor) 'n' in recipient facility *j* during the year *y*/Quantity of reactant *r* in the reactant mix at the inlet of the process (or reactor) *n* during the year *y* (**$m_{,p,n,j,y}$** / **$m_{,r,n,j,y}$**). These parameters are used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of the project activity the waste energy is used to generate electricity, therefore these parameters are not applicable.
- Flow of product *p* in the product mix at the outlet of the process (or reactor) *n* in recipient facility *j* in time interval *t*/flow rate of reactant *r* in the reactant mix at the inlet of the process (or reactor) *n* in time interval *t* (**$M_{,p,n,j,t}$** / **$M_{,r,n,j,t}$**). These parameters are used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of the project activity the waste energy is used to generate electricity, therefore these parameters are not applicable.
- Energy content of the steam generated in the waste heat recovery boiler fed to the turbine via a common steam header (**$ST_{whr,y}$**). This parameter is used to calculate the fraction f_{wcm} of energy produced by the project activity, however in the case of the proposed project activity f_{wcm} is equal to 1 since all the electricity generated by the project activity is obtained from the use of waste energy. Moreover the project is not generating mechanical energy or useful heat. Therefore this parameter is not applicable.
- Energy content of the steam generated in other boilers and fed to the turbine via a common steam header (**$ST_{other,y}$**). This parameter is used to calculate the fraction f_{wcm} of energy produced by the project activity, however in the case of the proposed project activity f_{wcm} is equal to 1 since all the electricity generated by the project activity is obtained from the use of waste energy. Moreover the project is not generating mechanical energy or useful heat. Therefore this parameter is not applicable.
- CO_2 emission factor of the heat source that would have supplied the recipient facility *j* in absence of the project activity, expressed in tCO_2/TJ (**$EF_{heat,j,y}$**). This parameter is used in the calculation of the baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy. However the in the case of the

project activity the waste energy is used to generate electricity, therefore this parameter is not applicable.

4.10.3 Management system and quality assurance

The electricity meters will be fitted with a telemetry system, and the data will be fed into the plant SCADA system on a daily basis. The main and check meters will be reconciled monthly to check if their readings are within a pre-defined accuracy band. If there are discrepancies, a notification will be sent to the control room to advise the operator to attend to the problem.

On a monthly basis, the project activity plant manager (or other designated employee) and a representative from Grootegeluk Coal Mine will read electricity meters to determine the quantity of electricity produced by the project activity. The electricity readings will be logged electronically for the purposes of calculating emission reductions.

The information will be saved onto the Exxaro's SCADA system, as well as Exxaro's on-site financial systems. Backups will be kept both on- and off-site, and all of the data will be available for CDM verification.

As per the methodology ACM0012 (version 04.0.0) /61/, all data collected as part of monitoring plan will be archived electronically and be kept at least for 2 years after the end of the last crediting period.

4.11 Environmental impacts

As confirmed by the DNA /81/, the project participant is required to carry out an Enviromental Scoping followed by an Environmental Assessment.

The Environmental Scoping Report, prepared by an independent consultant /6/, and relevant to the proposed project activity has been submitted to the Department of Economic development, Environment & Tourism of Limpopo Provincial Government on 18 April 2012 /38/. The authority has underlined the fact that the activity must not commence prior to an environmental authorization being granted by the Department of Economic development, Environment & Tourism.

The Environmental Scoping Report has been accepted by Department of Economic development, Environment & Tourism of Limpopo Provincial Government on 24 May 2012 /39/.

As required by local regulations and confirmed by the DNA /81/, after the acceptance of the Environmental Scoping Report, the project participant will proceed with an Environmental Impact Assesment.

As required by FAR 1 raised in this report, at the time of the first verification the project participant is requested to provide evidence of the approval of the Environmental Impact Assessment relevant to the proposed project activity.

According to a communication of the DNA of South Africa to the project developers /74/, projects with pending EIA approval may receive a Letter of Approval issued on a condition that the project will still comply with all relevant authorization as required by SA laws. The project developer will be required to submit to the DNA such authorizations once obtained. Moreover, as stated by the project participant in response to FAR 1, the Environmental Impact Assessment (EIA) Record of Decision (RoD) will be provided at the first Verification.

The content of the communication of the DNA of South Africa to the project developers /74/ was confirmed by the Letter of Approval /57/ issued by the DNA of South Africa on 13 July

2012. Indeed the letter is subject to the condition that the project must obtain all relevant authorizations as required by national laws.

According to the Enviromental Scoping Report /6/, the environmental process followed to date meets the requirements of the legislation to ensure that the regulatory authorities receive sufficient information to enable them to make an informed decision to accept the scoping report and approve the plan of study for EIA. The Environmental Scoping Report has been accepted by Department of Economic development, Environment & Tourism of Limpopo Provincial Government on 24 May 2012 /39/.

At the time of this Validation Report an Environmental Impact Assessment was not finalized. However, according to the Environmental Scoping Report /6/, specialist input and studies will be conducted for the following environmental components. The scope of work for these studies are outlined in the main report:

- Air Quality Impact Assessment
- Traffic Impact Assessment
- Surface Water Assessment
- Groundwater Assessment.

DNV could determine that no significant environmental impacts are expected from the project activity and that possible impacts were adequately mitigated.

4.12 Local stakeholder consultation

As confirmed by the DNA /81/, no specific regulations on the stakeholder consultation process are existing in South Africa. A local stakeholder consultation was held in Lephalale on 13 December 2011 /10/, Invitation to the meeting was advertised in the local newspaper the Mogol Pos and was supplemented by posters which were on display in a number of locations around Lephalale /30/.

The purpose of the meeting was to introduce stakeholders and interested parties to the project activity and to provide a platform from which comments could be gathered. The agenda of the consultation meeting included an introduction and attendance register sign in, a presentation of the project and a questions & answers section. A summary of these points and of the comments received /10/ has been reviewed by DNV and is in line with what the PP has reported in section E.2 of the PDD.

DNV considers the local stakeholder consultation carried out adequately.

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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	N/A
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	~~CAR 1~~ 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	~~CAR 1~~ 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	~~CL 6~~ 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	N/A
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	N/A
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 anthropogenic emissions of greenhouse gases by sources are reduced below those	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK

Requirement	Reference	Conclusion
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	~~CAR 4~~ ~~CL 11~~ ~~CL 12~~ ~~CL 13~~ ~~CL 14~~ ~~CL 15~~ 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

Requirement	Reference	Conclusion
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 (PS § 31, VVS § 62-63)					
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		OK
A.2 Description of the project activity (VVS § 64-69 and VVS § 150-157 for small-scale project activities, as applicable)					
A.2.1 How was the design of the project assessed?	/1/ /82/ /83/ /84/	DR I	*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		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				is appropriately justified through statistical 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		
A.2.2	If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/ /5/ /82/	DR I	During the site visit, the project participant /82/ confirmed that, when the validation commenced, the Market Coke Plant (the project facility) was at bankable feasibility stage, while the Market Coke WHR plant was at prefeasibility stage /5/. *CL 1: The project proponent is requested to clearly describe in the PDD the implementation status of both the project facility and the project activity. Moreover the project participant is requested to demonstrate that the investment decision to proceed with the implementation of the project facility is independent from the implementation of the project activity (i.e. the*	~~CL 1~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				project facility has to be financially attractive also without the implementation of the project activity).		
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	The project activity is a large scale project, therefore this is N/A.		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/ /5/	DR	*CL 2: The project proponent is requested to clearly describe the primary, secondary and tertiary combustion. Moreover Figure 4 of the PDD has to include an acronym legend and a legend describing each stream flow, clearly define the position of the tertiary combustion in the process and delimitate the project's system boundaries.* *CL 3: The project participant is requested to update the general layout of the plant annexed to the Pre-feasibility Study Report (dwg 6767-000-B15-104-00-00) and to insert the revised version in the PDD* /5/. *CL 4: The project participant is requested to clarify the inconsistencies between section A of the PDD (in particular Table 3) and the Pre-feasibility Study Report* /5/. *Moreover the project participant is requested to define in the above mentioned table the nominal capacity of the two generators in MW and to*	~~CL 2~~ ~~CL 3~~ ~~CL 4~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				describe the thermodynamic conditions of the Waste Energy Carrying Medium at the Waste Heat Recovery Boiler inlet and outlet.		
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/ /82/	DR I	During the site visit, DNV validation team was able to confirm that the proposed project activity is a Greenfield project, therefore this is N/A.		OK
A.2.6	Does the project design engineering reflect current good practices?	/1/ /5/	DR	The project activity mainly consists in the recovery of waste heat with a waste heat recovery boiler and in the generation of electricity through a Rankine cycle. The project design engineering as described in the Prefeasibility Study /5/ reflects current good practices.		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	As described in the assessment of the common practice analysis, there are no coke plants in South Africa in which the waste heat is recovered to produce electricity. Therefore the technology would result in a significantly better performance that any commonly used technologies in South Africa. There are no Annex-I parties involved in the project activity, therefore there is not any transfer of technology from an Annex-I party.		OK
A.3	**Participation and authorization (VVS § 38-52)**					
A.3.1	Do all participating Parties fulfil the participation requirements as follows:	/1/ South Africa (host)	DR			OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	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				
A.3.2	Do the letters of approval meet the following requirements?	/1/ /57/	DR	*CAR 1: The project participant is requested to submit the Letter of Approval issued by the DNA of the Republic of South Africa.*	~~CAR 1~~	OK
		South Africa (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				
	f) The LoA is issued by the respective Party's DNA	☒ Yes ☐ No				
	g) The LoA was received directly by the DNA or the PP	☐ DNA ☒ 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					
A.3.3	Have all private/public project participants been authorized by an involved Party?	/1/	DR	See CAR 1 above.	~~CAR 1~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A.4 Modalities of communications (VVS § 53-61)					
A.4.1 How has the corporate identity of all project participants and focal points included in the MoC, as well as the personal identities, including specimen signatures and employment status, of their authorized signatories, been validated?	/1/	DR	☐ Directly checking evidence for corporate, personal identity and other relevant documentation; ☐ Notarized documentation; ☒ Written confirmation from the project participant or the coordinating/managing entity that submits to it the MoC statement that all corporate and personal details, including specimen signatures, are valid and accurate. If this case was selected, DNV has confirmed that: ☒ the MoC statement was received from a project participant with whom DNV has a contractual relationship. ☐ the official who submits the MoC statement to the DOE and the official who signed the written confirmation (if a different person) is/are duly authorized to do so on behalf of the respective project participant		OK
A.4.2 Has the MoC statement been correctly completed and duly authorized? Check that all three requirements listed in the next column are complied with.	/1/	DR	☒ The latest version of the form F-CDM-MOC has been used; ☒ The information required as per the F-CDM-MOC, including its annex 1, is		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			correctly completed; ☒ The project participant is authorized signatories signing the F-CDM-MOC correspond to the project participantís authorized signatories included in F-CDM-MOC, annex 1.		
A.5 Technical description of the project activity (PS § 31, VVS § 64-69)					
A.5.1 Is the project's location clearly defined?	/1/	DR	The project activity will be located at the Grootegeluk Coal Mine on the farm Daarby 458 LQ, approximately 25 km west of the town of Lephalale (formerly Ellisras), in the Limpopo Province of South Africa. *CL 5: The project participant is requested to clarify which point of measurement the coordinates of the project activity are referring to.*	~~CL 5~~	OK
A.6 Public funding of the project activity (CDM Modalities and Procedures Appendix B § 2)					
A.6.1 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	*CL 6: The project participant is requested to provide evidence that ODA or public funding has not and will be not used in the development and implementation of the project.*	~~CL 6~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B Application of a baseline and monitoring methodology					
B.1 Methodology applied (VVS para 70-133 and VVS § 150-153 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/ /61/	DR	Yes. The approved methodology ACM0012 "*Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects*" (version 04.0.0) /61/ is applied for the proposed project activity.		OK
B.1.2 If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?	/1/ /61/ /62/ /63/ /64/ /66/ /67/ /68/	DR	The following tools, provided by the CDM EB in respect to the applied methodology /61/, have been considered: - Tool for the demonstration and assessment of additionality /62/ - Tool to calculate the emission factor for an electricity system /63/ - Tool to determine the remaining lifetime of equipment /64/ - Guidelines on additionality of first-of-its-kind project activities /66/ - Guidelines on common practice /67/ - Guidelines on the assessment of investment analysis /68/ *CAR 2: The project participant is requested to use the latest available versions both of the EB tools and of the EB guidance.* *CAR 3: The project participant is requested*	~~CAR 2~~ ~~CAR 3~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				to comply with Annex 59 of EB 51: "Information note: previous rulings related to the appropriateness of benchmarks for project activities utilizing waste heat/waste gas for power generation" in the benchmark selection of the investment analysis.		
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/ /61/	DR	The project applies the methodology ACM0012 (version 04.0.0) /61/, which is not a small-scale methodology. Therefore this is N/A.		OK
B.2	**Applicability of methodology (and tools) (VVS § 73-77)** *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: The consolidated methodology is applicable to project activities implemented in an existing or Greenfield facility converting waste energy carried in identified WECM stream(s) into useful energy. The WECM stream may be an energy source for: • Generation of electricity; • Cogeneration; • Direct use as process heat source; • Generation of heat in element process; • Generation of mechanical energy; or	/1/ /61/ /5/ /82/	DR I	The project activity converts waste energy carried in identified WECM stream into useful energy. The WECM stream is an energy source for electricity generation, as detailed in the prefeasibility study report (PFS) /5/. As verified during the site visit, the proposed project activity is implemented in a Greenfield facility.		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	• Supply of heat of reaction with or without process heating.					
B.2.2	How was it validated that project complies with the following applicability criteria: In the absence of the project activity, the WECM stream: (a) Would not be recovered and therefore would be flared, released to atmosphere, or remain unutilized in the absence of the project activity at the existing or Greenfield project facility; or (b) Would be partially recovered, and the unrecovered portion of WECM stream would be flared, vented or remained unutilised at the existing or Greenfield project facility.	/1/ /61/	DR	*CL 7: The project participant is requested to provide evidence that in the absence of the project activity the WECM stream would neither be recovered nor partially be recovered and therefore would be flared, released to atmosphere, or remain unutilized.*	~~CL 7~~	OK
B.2.3	How was it validated that project complies with the following applicability criteria: Project activities improving the WECM recovery may (i) capture and utilise a larger quantity of WECM stream as compared to the historical situation in existing facility, or capture and utilise a larger quantity of WECM stream as compared to a "reference waste energy generating facility"; and/or (ii) apply more energy efficient equipment to replace/modify/expand waste energy recovery equipment, or implement a more energy efficient equipment than the "reference waste energy generating facility".	/1/ /61/ /82/	DR I	As verified during the site visit, the proposed project activity is implemented in a Greenfield facility. The project is not improving the WECM recovery, therefore this is N/A.		OK
B.2.4	How was it validated that project complies with the following applicability criteria: The methodology is applicable under the following	/1/ /61/ /5/	DR I	• As described in the PFS /5/, the project activity does not recover waste pressure. Therefore this is N/A.		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	conditions: • For project activities which recover waste pressure, the methodology is applicable where waste pressure is used to generate electricity only and the electricity generated from waste pressure is measurable; • Regulations do not require the project facility to recover and/or utilize the waste energy prior to the implementation of the project activity; • The methodology is applicable to both Greenfield and existing waste energy generation facilities. If the production capacity of the project facility is expanded as a result of the project activity, the added production capacity must be treated as a Greenfield facility; • Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the project facility shall not be included in the emission reduction calculations.	/81/ /82/		• As confirmed by the DNA /81/, no South African regulations require the use of the waste energy. • As verified during the site visit, the proposed project activity is a Greenfield facility. • According to the PDD, under abnormal conditions (emergencies, plant shut down etc.) of either the project facility or project activity, waste energy released will not form part of the emissions reductions calculations.		
B.2.5	How was it validated that project complies with the following applicability criteria: If multiple waste gas streams are available in the project facility and can be used interchangeably for various applications as part of the energy sources in the facility, the recovery of any waste gas stream, which would be totally or partially recovered in the absence of the project activity, shall not be reduced due to the implementation of CDM project activity. For such situations, the guidance provided in Annex 3 shall be followed.	/1/ /61/ /5/	DR	As described in the PFS /5/ and in the environmental scoping report /6/, no multiple waste gas streams are available in the project facility, therefore this is N/A.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.2.6	How was it validated that project complies with the following applicability criteria: The methodology is **not** applicable to the cases where a WECM stream is partially recovered in the absence of the CDM project activity to supply the heat of reaction, and the recovery of this WECM stream is increased under the project activity to replace fossil fuels used for the purpose of supplying heat of reaction.	/1/ /61/	DR	See CL 7 above.	~~CL 7~~	OK
B.2.7	How was it validated that project complies with the following applicability criteria: This methodology is also **not** applicable to project activities where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel generator) to generate power. However, the projects recovering waste energy from single cycle and/or combined cycle power plants for the purpose of generation of heat only can apply this methodology.	/1/ /61/ /5/	DR	As described in the PFS /5/, the project activity recovers waste heat produced as part of the coking pyrolysis process in the project facility and does not recover waste energy from a single and or combined cycle power plant.		OK
B.2.8	How was it validated that project complies with the following applicability criteria: The emission reduction credits can be claimed up to the end of the lifetime of the waste energy generation equipment. The remaining lifetime of the equipment should be determined using the latest version of the "Tool to determine the remaining lifetime of equipment".	/1/ /61/	DR	Emission reduction credits can be claimed only during the crediting period, which is, according to the PDD, fixed and with a duration of 10 years. *CL 8: The project participant is requested to provide evidence of the operational lifetime of the waste energy generation equipment and to determine the remaining lifetime of the equipment using the latest version of the "Tool to determine the remaining lifetime of*	~~CL 8~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				equipment".		
B.2.9	How was it validated that project complies with the following applicability criteria: The extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity will be determined in accordance with the procedures provided in Annex 1 (for Greenfield project facilities) and in Annex 2 (for existing project facilities) to this methodology.	/1/ /61/	DR	*CL 9: The project participant is requested to clarify how the proposed project activity complies with the following applicability criterion: "The extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity will be determined in accordance with the procedures provided in Annex 1 (for Greenfield project facilities) and in Annex 2 (for existing project facilities) to this methodology."*	~~CL 9~~	OK
B.2.10	How was it validated that project complies with the following applicability criteria: In addition, the applicability conditions included in the tools referred to above apply.	/1/ /61/	DR	*CL 10: The project participant is requested to demonstrate how the proposed project activity complies with the following applicability criterion: "In addition, the applicability conditions included in the tools referred to above apply."*	~~CL 10~~	OK
B.2.11	Is the selected baseline on of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/ /61/	DR	The selected baseline, i.e. the combination of alternative W2 and P10 described in the methodology /61/, confirms the applicability of the methodology /61/.		OK
B.3	**Project boundary (VVS § 82-87)**					
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/ /61/ /63/	DR	According to the methodology ACM0012 (version 04.0.0) /61/, the geographical extent project boundary shall include the relevant WECM stream(s), equipment and energy distribution system in the project facility and in the recipient facility.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			According to Figure 4 of the PDD, the project boundary includes the proposed project facility, containing the coke ovens where the coke oven flue gas is generated and the associated and co-located project activity containing the gas system, waste heat recovery boilers, steam system with turbines, generators, switchgear, control systems and ancillary equipment. According to the methodology /61/, the spatial extent of the grid is as defined in the Tool to calculate the emission factor for an electricity system /63/. As per the PDD, the South African national electricity grid operated by Eskom which supplies the electricity to the Grootegeluk Coal Mine, also forms part of the project boundary for the purposes of determining the baseline and grid emissions factor (GEF). The project's system boundaries are clearly defined and in accordance with the methodology /61/.		
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/ /61/	DR	The sources of the baseline emissions are the following: • Electricity generation, grid or captive source The sources of the project emissions are the following:		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			• Supplemental fossil fuel consumption at the project plant • Supplemental electricity consumption No sources of leakage emissions are considered in the methodology /61/. The identified boundary covers all possible sources linked to the project activity. The identified boundary and selected sources and gases are justified for the project activity.		
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/ /61/	DR	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 methodology ACM0012 (version 04.0.0) /61/.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.4 Baseline scenario determination and description (VVS § 88-95 / Identification of alternatives to the project activity (VVS § 113-116) *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? Does the list include as one of the options that the project activity is undertaken without being registered as a proposed project activity? Does the list contains all plausible alternatives which are viable means of supplying the comparable outputs or services that are to be supplied by the proposed project activity?	/1/ /61/	DR	According to the methodology ACM0012 (version 04.0.0) /61/, the baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s). Realistic and credible alternatives should be determined for: • Waste energy use in the absence of the project activity; • Power generation in the absence of the project activity for each recipient facility if the project activity involves electricity generation for that recipient facility; • Heat generation (process heat and/or heat of reaction) in the absence of the project activity, for each recipient facility if the project activity involves generation of useful heat for that		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			recipient facility; and • Mechanical energy generation in the absence of the project activity, for each recipient facility if the project activity involves generation of useful mechanical energy for that recipient facility. The project participant determined realistic and credible alternatives for: • Waste energy use in the absence of the project activity; and • Power generation in the absence of the project activity for each recipient facility if the project activity involves electricity generation for that recipient facility. Since the project activity does not generate heat (process heat and/or heat of reaction) or mechanical energy as outputs, realistic and credible alternatives have not been identified for these. The list of baseline scenarios is complete and in accordance with the methodology /61/. The list contains all plausible alternatives which are viable means of supplying the comparable outputs or services that are to be supplied by the proposed project activity.		
B.4.2 How have the other baseline scenarios been eliminated	/1/	DR	*CL 11: The project participant is requested*	~~CL 11~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
in order to determine the baseline?	/61/		*to further substantiate the elimination of all non-plausible options within step 1 of the methodology by providing relevant evidences.* *CL 12: The project participant is requested to provide evidence of past, present and future electricity demand of the Grootegeluk Coal Mine.* *CL 13: The project participant is requested to further demonstrate that the alternative P8 is not a plausible alternative to the project activity.* *CL 14: The project participant is requested to further demonstrate that the alternatives W4 and W6 are not plausible alternatives to the project activity, taking into consideration the steam needs of the char plant located nearby the project activity.* *CAR 4: According to Step 2 of baseline methodology procedure, the project proponents are required to use economic analysis for the identification of the baseline scenario where the CDM waste energy recovery project is implemented in a Greenfield project facility. The investment analysis for the Greenfield projects include*	~~CL 12~~ ~~CL 13~~ ~~CL 14~~ ~~CAR 4~~	

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				the cost of the fuel that would have been used by the recipient facility(ies) in the absence of the CDM project. The fuels for such analysis should include all the fuels available in the host country, including those which can be imported in the host country.		
B.4.3	What is the baseline scenario?	/1/ /61/	DR	The baseline scenario is the combination of alternative W2 for the use of waste energy – WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized – and P10 for power generation – Sourced from grid-connected power plants.		OK
B.4.4	Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/ /61/	DR	See CL 11, CL 12, CL 13, CL 14 and CAR 4.	~~CL 11~~ ~~CL 12~~ ~~CL 13~~ ~~CL 14~~ ~~CAR 4~~	OK
B.4.5	Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	See CL 11 above.	~~CL 11~~	OK
B.4.6	Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies? Does the baseline scenario comply with all applicable and enforced legislation?	/1/ /81/	DR	As confirmed by the DNA /81/, the baseline scenario is in accordance with all mandatory laws and regulations. *CL 15: The project proponent are requested to provide evidence of the health, safety and environmental legislation according to which the waste gas would need to be combusted*	~~CL 15~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			and vented.		
B.4.7 Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	See ~~CL 11~~ above.	~~CL 11~~	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	See CAR 4, CL 11, CL 12, CL 13, CL 14 and CL 15 above.	~~CAR 4~~ ~~CL 11~~ ~~CL 12~~ ~~CL 13~~ ~~CL 14~~ ~~CL 15~~	OK
B.5 Additionality determination (VVS § 101-129 and VVS § 158-161 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/ /61/ /62/	DR	According to the methodology ACM0012 (version 04.0.0) /61/, the additionality of the project activity shall be demonstrated and assessed using the latest version of the Tool for the demonstration and assessment of additionality /62/. The project proponent followed the indication of the methodology /61/, however the tool is not the latest available version	~~CAR 2~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				when the validation started.		
B.5.2	Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR	See CL 15 above.	~~CL 15~~	OK
B.5.3	Is sufficient evidence provided to support the relevance of the arguments made?	/1/ /5/ /27/	DR	All input data of the investment analysis and of the common practice analysis have been supported by proper evidences.		OK
B.5.4	What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/ /2/	DR	The project additionality is mainly based on investment analysis /2/.		OK
Prior consideration of CDM (VVS § 105-112)						
B.5.5	Is the project start date before 2 August 2008 or on/after 2 August 2008?	/1/	DR	☒ On or after 2 August 2008; ☐ Before 2 August 2008; *Refer to C.1.1 for the validation of project start date.* *CL 16: The project participant is requested to indicate the evidences of all the events listed in the table providing the timeline for the proposed project activity. Moreover the project participant is requested to submit the above mentioned evidences.*	~~CL 16~~	OK
B.5.6	If the starting date is on or after 2 August 2008 and before the global stakeholder consultation (or a new methodology proposed or request for revision of an approved methodology is requested), has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM status within 180 days of the project acidity start date?	/1/ /82/ /83/ /81/	DR I	The proposed starting date of the project activity is August 2013, which is a future date. During the site visit the project participant confirmed that no commitment to expenditures related to the implementation or related to the construction of the project activity has been taken so far /82//83/. The above was confirmed also by the DNA /81/.		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Since the global stakeholder consultation took place between 28 January 2012 and 26 February 2012, this is N/A.		
B.5.7	If in addition to the above, the PDD was not published for global stakeholder consultation (or a new methodology proposed or request for revision of an approved methodology is requested) within two years of the initial notification, have project participants every subsequent two years after the initial notification informed the UNFCCC secretariat of the progress of the project activity?	/1/	DR	The PDD was published for global stakeholder consultation on 28 January 2012, prior to the project starting date. Therefore this is not applicable.		OK
	Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)					
B.5.8	What initiatives where taken by the project participants from the starting date of the project activity to the start of validation in parallel with the physical implementation of the project activity?	/1/	DR	The proposed starting date of the project activity is August 2013, therefore this is N/A.		OK
B.5.9	When did the construction of the project activity start?	/1/	DR	Not applicable.		OK
B.5.10	When was the project commissioned?	/1/	DR	Not applicable.		OK
B.5.11	Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/1/	DR	Not applicable.		OK
	Investment analysis (VVS § 117-123) *The list of questions below must be adjusted to the parameters in the investment analysis relevant to the project under validation. <u>All</u> input parameters need to be assessed.*					
B.5.12	Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this	/1/	DR	Since the project participant is requested to further demonstrate that there are no	~~CL 11~~ ~~CL 13~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	reflected in the PDD?			plausible baseline scenarios that could be feasible (i.e. alternatives where barriers are not prohibitive or which are not clearly economically unattractive), DNV is not able to assess whether or not remaining alternatives that could generate revenues apart from CDM are existing.	~~CL 14~~	
B.5.13	Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR	See CL 11, CL 13 and CL 14 above.	~~CL 11~~ ~~CL 13~~ ~~CL 14~~	OK
B.5.14	Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	See CL 11, CL 13 and CL 14 above.	~~CL 11~~ ~~CL 13~~ ~~CL 14~~	OK
B.5.15	Is the benchmark/discount rate the latest available at the time of decision?	/1/	DR	*CL 17: Since the data used in the investment analysis are more than 1 year old, the project participant is requested to demonstrate that the values adopted in the investment analysis, including the benchmark, are still valid at the time of this validation.*	~~CL 17~~ ~~CAR 3~~	OK
B.5.16	What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/	DR	See CAR 3 above.	~~CAR 3~~	OK
B.5.17	Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/1/ /2/	DR	The underlying assumptions are appropriate, indeed according to the IRR calculation /2/, the WECM is considered to have zero values, since it would be wasted in the baseline scenario.		OK
B.5.18	Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with	/1/ /27/	DR	The income tax calculation takes the depreciation into account. Depreciation is in		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	normal accounting practice in the host country?			accordance with normal accounting practice in the host country /27/: • For major equipment 40% of the investment cost for the first year and 20% of the investment cost for the subsequent three years. • For other equipment 5% of the investment cost yearly.		
B.5.19	Is the time period of the investment analysis and operating time of the project realistic? Has salvage value been taken into account? Is working capital returned in the last year of operation?	/1/	DR	The period of the investment analysis coincides with the operating time of the project activity, which is 20 years. *CL 18: The project participant is requested to provide evidence of the selected operational lifetime of the project activity.* *CL 19: The project participant is requested to clarify why neither salvage value nor working capital have been included as a cash inflow in the last year of operation.*	~~CL 18~~ ~~CL 19~~	OK
B.5.20	When 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/ /5/	DR	The main input values of the investment analysis are sourced from the PFS /5/ prepared by Engineering & Projects Company (E&PC), which is an independent entity from the project participant.	~~CL 4~~ ~~CL 17~~	OK
B.5.21	How was the amount of output (e.g. sales of electricity) assessed?	/1/ /5/	DR	☐ The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				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 plant load factor has been obtained considering that, according to the PFS /5/, the overall power plant planned availability allowing for all stops is 350 days per annum.		
B.5.22	How was the output price (e.g. electricity price) assessed? Were the data available and valid at the time of decision?	/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 *CL 20: The project participant is requested to provide evidence of all input data of the investment analysis, as indicated during the site visit.*	~~CL 20~~	OK
B.5.23	How were the investment costs assessed? Were the data available and valid at the time of decision?	/1/ /5/	DR	☐ Cross-check against third-party or publicly 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		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				project participants The investment costs are sourced from the PFS /5/ prepared by Engineering & Projects Company (E&PC), which is an independent entity from the project participant. The PFS /5/ was finalized on 1 February 2011 and so far no investment decision has been taken. However the data are available and valid for an investment decision in the near future.		
B.5.24	How were the O&M costs assessed? Were the data available and valid at the time of decision?	/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 See CL 20 above.	~~CL 20~~	OK
B.5.25	Describe the assessment of the other input parameters. Were the data available and valid at the time of decision?	/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 See CL 20 above.	~~CL 20~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.26	Was the financial calculation spreadsheet verified and found to be correct?	/1/ /61/	DR	*CAR 5: According to the methodology ACM0012 (version 04.0.0) /61/, the project participants are required to use investment analysis for demonstrating additionality where the CDM waste energy recovery project is implemented in a Greenfield project facility. The investment analysis for the Greenfield projects include the cost of the fuel that would have been used by the recipient facility(ies) in the absence of the CDM project. The fuels for such analysis should include all the fuels available in the host country, including those, which can be imported in the host country.* *The project participant is requested to revise the financial calculation spreadsheet accordingly.* *CAR 6: The project participant is requested to correct the IRR calculation spreadsheet, since gross and net capacities are not consistent with the PFS. Moreover equity IRR calculation with CER revenues and sensitivity analysis summary are not correct.*	~~CAR 5~~ ~~CAR 6~~	OK
B.5.27	Sensitivity 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 key parameters contributing to more than 20% of the revenue/costs during operating or implementation have been identified as follows: • Hard and Soft CAPEX (Total CAPEX)	~~CAR 6~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				• Fixed and Variable OPEX (Total OPEX) • Electricity tariff • Electrical output		
B.5.28	Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/	DR	The key parameters contributing to more than 20% of the revenue/costs has been varied in a range of -10% to +10%. *CL 21: The project participant is requested to provide evidence that the range of variations in the sensitivity analysis is reasonable in the project context.*	~~CL 21~~	OK
B.5.29	Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/1/	DR	The key parameters have been varied to reach the benchmark and the likelihood of this to happen has been properly justified to be small.		OK
	Barrier analysis (VVS § 124-127)					
B.5.30	Are 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	The project participant did not undertake a barrier analysis, therefore this is N/A.		OK
B.5.31	How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR	Not applicable.		OK
B.5.32	How does CDM alleviate the investment barriers?	/1/	DR	Not applicable.		OK
B.5.33	Is 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	/1/	DR	Not applicable.		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	circumstances?					
B.5.34	How were the technological barriers assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/	DR	Not applicable.		OK
B.5.35	How does CDM alleviate the technological barriers?	/1/	DR	Not applicable.		OK
B.5.36	Is the project activity prevented by the technological 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.5.37	How 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.5.38	How does CDM alleviate the barriers due to prevailing practise?	/1/	DR	Not applicable.		OK
B.5.39	Is 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.5.40	How 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.5.41	How does CDM alleviate the other barriers?	/1/	DR	Not applicable.		OK
B.5.42	Is 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

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Common practice analysis (VVS § 128-130)						
B.5.43	What is the geographical scope of the common practice analysis? Is this justified?	/1/ /67/ /62/	DR	The geographical scope of the common practice analysis is the geo-political boundaries of South Africa. This is the default choice both in accordance with the Guidelines on common practice /67/ and Tool for the demonstration and assessment of additionality /62/.		OK
B.5.44	What 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/ /62/	DR	According to the Tool for the demonstration and assessment of additionality /62/, for project activities that involve switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies), a stepwise procedure has to be used to carry out the common practice analysis. *CAR 7: The project proponent is requested to revise the applicable output range in accordance with the capacity indicated in the Pre-Feasibility Study Report.*	~~CAR 7~~	OK
B.5.45	What is the data source(s) used for the common practice analysis?	/1/	DR	*CL 22: The project proponent is requested to indicate in the PDD the data sources used in the common practice analysis (i.e. According to the PDD, in South Africa there are currently no plants that deliver the same output or capacity as the proposed project activity.)*	~~CL 22~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.46	How many similar non-CDM-projects exist in the region within the scope?	/1/	DR	See CL 22 above.	~~CL 22~~	OK
B.5.47	How were possible essential distinctions between the project activity and similar activities assessed?	/1/	DR	See CL 22 above.	~~CL 22~~	OK
B.5.48	What is the conclusion of the common practice analysis?	/1/ /62/	DR	*CAR 8: The project participant is requested to apply the latest available version of the Tool for the demonstration and assessment of additionality /62/, which includes the requirement of the Guidelines on common practice.*	~~CAR 7~~ ~~CAR 8~~ ~~CL 22~~	OK
Conclusion						
B.5.49	What is the conclusion with regard to the additionality of the project activity?	/1/	DR	See CAR 2, CAR 3, CAR 5, CAR 6, CAR 7, CAR 8, CL 4, CL 11, CL 13, CL 14, CL 15, CL 16, CL 17, CL 18, CL 19, CL 20, CL 21 and CL 22. CARs and CLs were raised on the additionality of the project activity, therefore a conclusion will be given only in the Final Validation Report.	~~CAR 2~~ ~~CAR 3~~ ~~CAR 5~~ ~~CAR 6~~ ~~CAR 7~~ ~~CAR 8~~ ~~CL 4~~ ~~CL 11~~ ~~CL 13~~ ~~CL 14~~ ~~CL 15~~ ~~CL 16~~ ~~CL 17~~ ~~CL 18~~ ~~CL 19~~ ~~CL 20~~ ~~CL 21~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				~~CL 22~~	
B.6 Algorithms and/or formulae used to determine emission reductions (VVS § 96-100)					
Data and parameters that are available at validation and that are not monitored					
B.6.1 How was the CO_2 emission factor for the electricity source i, displaced due to the project activity, during the year y ($\mathbf{EF_{elec,i,j,y}}$) available at validation verified?	/1/ /63/ /3/ /61/	DR	It is equal to 0.976 tCO_2/MWh and it has been obtained following the Tool to calculate the emission factor for an electricity system /63/. The calculations provided in the spreadsheet Grid Emission Factor and Emission Reduction calculation /3/ were found correct and supported by proper evidence. The methodological choices followed the project participant are described in section B.6.2 of this table. *CAR 9: According to the methodology ACM0012 (version 04.0.0) /61/, the quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y ($\boldsymbol{EG_{i,j,y}}$) is a parameter to be monitored, not a parameter to be fixed ex-ante.*	~~CAR 9~~	OK
Baseline emissions					
B.6.2 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /61/ /63/	DR	According to the methodology ACM0012 (version 04.0.0) /61/ baseline emissions for baseline scenario 1 and 2 are calculated as		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	/44/ /45/		follows: $$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y}$$ Where: • $BE_{Elec,y}$ are the baseline emissions from electricity during the year y in tCO_2 • $BE_{Ther,y}$ are the baseline emissions from thermal energy (due to heat generation by elemental processes) during the year y (tCO_2) The project activity produces only electricity, therefore: $$BE_{Ther,y} = 0$$ Thus the baseline emissions are: $$BE_{En,y} = BE_{Elec,y}$$ Since the proposed project activity consists in the recovery of waste heat for electricity generation /5/, the baseline emissions are relevant to electricity generation (paragraph 1.1.1 (a) of the methodology /61/) and Case 1 (Waste energy is used to generate electricity), as described in the methodology /61/, applies. Therefore:		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			$BE_{Elec,y} = f_{cap} \times f_{wcm} \times \sum_j \sum_i \left(EG_{i,j,y} \times EF_{Elec,i,j,y}\right)$ Where: • $BE_{Elec,y}$ are the baseline emissions due to displacement of electricity during the year y • $EG_{i,j,y}$ is the quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y • $EF_{elec,i,j,y}$ is the CO_2 emission factor for the electricity source i (gr for the grid, and is for an identified source), displaced due to the project activity, during the year y • f_{wcm} is the fraction of total electricity generated by the project activity using waste energy. It is equal to 1 since all the electricity generated by the project activity is obtained from the use of waste energy. • f_{cap} is the factor that determines the energy that would have been produced in project year y using waste energy generated at a historical level, expressed as a fraction of the total energy produced using waste source in year y. It is equal to 1 since		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			the facility is Greenfield. $EF_{elec,i,j,y}$ has been calculated according to the Tool to calculate the emission factor for an electricity system, Version 2.2.1 /63/ following six steps: <u>STEP 1: Identify the relevant electricity systems</u> The electric power system has been defined as the South African National grid. <u>STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)</u> The project participant chose to calculate the operating margin and build margin emission factor following: Option I: Only grid power plants are included in the calculation. <u>STEP 3: Select a method to determine the operating margin (OM)</u> The project participant chose to calculate the operating margin emission factor ($EF_{grid,OM,y}$) following the method: (a) Simple Operating Margin According to the Tool to calculate the emission factor for an electricity system /63/,		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			the simple OM method (Option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. The project participant chose to determine the emissions factor using the data vintage: Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation. As a consequence, the operating margin emission factor is calculated ex-ante and will remain fixed during the first crediting period. <u>STEP 4: Calculate the operating margin emission factor according to the selected method</u>		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Option A1 has been selected, where the emission factor of each power unit is calculated based on the net electricity generation and a CO_2 emission factor of each power unit. The emission factor of each power unit is calculated based on the amount of fuel consumed, fuel NCV, fuel emission factor, and electricity generation. STEP 5: Calculate the build margin (BM) emission factor The sample group of power units m used to calculate the build margin has been determined as per the procedure described in the tool. Since all most recent power units have more than 10 years and there are no units registered with the CDM, $SET_{\geq 20\%}$ including Majuba, Kendal and Matimba with 73 611 253 MWh/year has been used to calculate the build margin. STEP 6: Calculate the combined margin emissions factor The combined margin has been calculated based on the weighted average approach. The weighting selected to calculate the combined margin is $W_{OM} = 0.5$ and $W_{BM} = 0.5$. This is in accordance with the tool since the project does not involve wind or solar power generation.		

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				The combined grid emission factor has been calculated to be 0.976 tCO_2/MWh.		
B.6.3	Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Conservative assumptions have been used when calculating the baseline emissions.		OK
B.6.4	Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	No uncertainties were found in the baseline emission calculations.		OK
	Project emissions					
B.6.5	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /61/ /5/	DR	According to the methodology /61/, project emissions are calculated as follows: $$PE_y = PE_{AF,y} + PE_{EL,y}$$ Where: • PE_y are the project emissions due to the project activity • $PE_{AF,y}$ are project activity emissions from on-site consumption of fossil fuels by the unit process(es) and/or co-generation plant(s) if they are used as supplementary fuels due to non-availability of waste energy to the project activity or due to any other reason • $PE_{EL,y}$ are project activity emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption In the case of the project activity, which will		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				supply electricity to the Grootegeluk Coal Mine (the recipient facility) which includes the project facility and the project activity: $PE_{EL,y} = 0$ because the only electricity consumption of the project activity /5/ is the gas cleaning equipment, which is consumed in the baseline scenario as well and therefore, according to the methodology /61/, can be ignored. Moreover since in the project activity no fossil fuel will be used: $PE_{AF,y} = 0$ Therefore: $PE_{y} = 0$		
B.6.6	Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Conservative assumptions have been used when calculating the project emissions.		OK
B.6.7	Are uncertainties in the project emission estimates properly addressed?	/1/	DR	No uncertainties were found in the project emission calculations.		OK
Leakage						
B.6.8	Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /61/	DR	No leakage is applicable under the methodology ACM0012 (version 04.0.0) /61/.		OK
B.6.9	Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	Not applicable.		OK
B.6.10	Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	Not applicable.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Emission Reductions					
B.6.11 Algorithms 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/ /61/	DR	• 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 /61/ 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.		OK
B.7 Monitoring plan (VVS § 131-133)					
Data and parameters monitored					
B.7.1 Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/ /61/	DR	*CAR 10: Methodology ACM0012 (version 04.0.0) /61/ requires the parameter "Abnormal operation of the project facility including emergencies and shut down" to be monitored. The project participant is requested to comply with the above mentioned methodological requirement.*	~~CAR 10~~	OK
B.7.2 Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	*CL 23: The project participant is requested to clarify how the electricity delivered to the grid and not supplied to the recipient j will be*	~~CL 23~~ ~~CL 24~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				measured. *CL 24: The project participant is requested to submit a single line diagram of the electricity network in the Grootegeluk Coal Mine, indicating where all the electricity meters relevant to the project activity will be installed.*		
B.7.3	In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR	• The quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y ($\mathbf{EG_{i,j,y}}$). It will be measured continuously using electricity meters.		OK
B.7.4	In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/ /61/	DR	The methodology ACM0012 (version 04.0.0) /61/ does not require the measurement accuracy to be addressed.		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	• The quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y ($\mathbf{EG_{i,j,y}}$). The electricity meters will be calibrated and maintained according to the manufacturer's specifications.		OK
B.7.6	Is the monitoring frequency adequate for all monitoring	/1/	DR	• The quantity of electricity supplied to		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	parameters? Describe each parameter.			the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y ($\mathbf{EG_{i,j,y}}$). The meter readings will be aggregated monthly for use in the monitoring report.		
B.7.7	Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	• The quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y ($\mathbf{EG_{i,j,y}}$). The information will be monthly saved onto Exxaro's Supervisory Control and Data Acquisition (SCADA) system.		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 plan is mainly focused on the monitoring of the quantity of electricity supplied to the Grootegeluk Coal Mine by the Waste Heat Recovery plant , which in the absence of the project activity would have been sourced from sourced from the grid. Main and backup electricity meters will be installed on the feeds of the recipient plant. Therefore the monitoring arrangements described in the monitoring plan are feasible within the project design.		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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/	DR	The electricity meters will be fitted with a telemetry system, and the data will be fed into the plant SCADA system on a daily basis. The main and check meters will be reconciled monthly to check if their readings are within a pre-defined accuracy band. If there are discrepancies, a notification will be sent to the control room to advise the operator to attend to the problem. On a monthly basis, the project activity plant manager (or other designated employee) and a representative from Grootegeluk Coal Mine will read electricity meters to determine the quantity of electricity produced by the project activity. The electricity readings will be logged electronically for the purposes of calculating emission reductions.		OK
B.7.10	Are 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	The information will be saved onto the Exxaro's SCADA system, as well as Exxaro's on-site financial systems. Backups will be kept both on- and off-site, and all of the data will be available for CDM verification.		OK
B.7.11	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/ /61/	DR	As per the methodology ACM0012 (version 04.0.0) /61/, all data collected as part of monitoring plan will be archived electronically and be kept at least for 2 years after the end of the last crediting period.		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	Monitoring of sustainable development indicators/ environmental impacts					
B.7.12	Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/ /81/	DR	As confirmed by the DNA /81/, the monitoring of sustainable development indicators/ environmental impacts is not warranted by legislation in south Africa.		OK
B.7.13	Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	The monitoring plan does not provide for the collection and archiving of relevant data concerning environmental, social and economic impacts.		OK
B.7.14	Are the sustainable development indicators in line with stated national priorities in the host country?	/1/ /81/	DR	As confirmed by the DNA /81/, the sustainable development indicators are in line with stated national priorities in South Africa.		OK
C	**Duration of the project activity / crediting period**					
	C.1.1 Start date of project activity (VVS § 106 & 112, PS § 57-62)					
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/ /69/	DR	The proposed starting date of the project activity is the expected construction start date, which is August 2013. *CL 25: The project participant is requested to clarify how the proposed starting date fulfils the requirements indicated in the Glossary of CDM terms /69/.*	~~CL 25~~	OK
C.1.3	Is the stated expected operational lifetime of the project activity reasonable?	/1/	DR	See CL 18 above.	~~CL 18~~	OK
C.1.4	Is the start date, the type (renewable/fixed) and the	/1/	DR	The start date of the crediting period is		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	length of the crediting period clearly defined and reasonable?			defined as the date of project commissioning, which is expected on 1 August 2015. A fixed crediting period of 10 years has been chosen by the project participant. The start date, the type and the length of the crediting period are clearly defined and reasonable.		
D	**Environmental Impacts (VVS § 134-137)**					
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/ /81/ /6/ /74/	DR	As confirmed by the DNA /81/, the project participant is required to carry out an Enviromental Scoping followed by an Environmental Assessment. The scoping report has been prepared by an independent consultant (Synergistics) /6/, however at the time of this Draft Validation Report was still requesting approval. According to a communication of the DNA of South Africa to the project developers, projects with pending EIA approval may receive a Letter of Approval with the condition The letter of approval will be issued on a condition that the project will still comply with all relevant authorization as required by SA laws. The project developer will be required to submit to the DNA such documentation once obtained /74/. CL 26*: The project participant is requested*	~~CL 26~~ FAR 1	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				to provide evidence of the approval of the Environmental Scoping Report. *FAR 1: At the time of the first verification the project participant is requested to provide evidence of the approval of the Environmental Impact Assessment relevant to the proposed project activity.*		
D.1.2	Does the project comply with environmental legislation in the host country?	/1/ /6/	DR	According to the Enviromental Scoping Report /6/, the environmental process followed to date meets the requirements of the legislation to ensure that the regulatory authorities receive sufficient information to enable them to make an informed decision to accept the scoping report and approve the plan of study for EIA.		OK
D.1.3	Will the project create any adverse environmental effects?	/1/ /6/	DR	At the time of the Draft Validation Report an Environmental Impact Assessment was not finalized. However, according to the Environmental Scoping Report /6/, specialist input and studies will be conducted for the following environmental components. The scope of work for these studies are outlined in the main report: • Air Quality Impact Assessment • Traffic Impact Assessment • Surface Water Assessment • Groundwater Assessment.		OK
D.1.4	Have identified environmental impacts been addressed	/1/	DR	See here above.		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	in the project design?					
D.1.5	Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/	DR	See here above.		OK
D.1.6	Are transboundary environmental impacts considered in the analysis?	/1/ /6/	DR	No transboundary environmental impacts is foreseen for the proposed project activity /6/.		OK
E Stakeholder Comments (VVS § 138-140)						
E.1.1	Have relevant stakeholders been consulted?	/1/ /10/	DR	The local stakeholder consultation was held in Lephalale on 13 December 2011, the purpose of the meeting was to introduce stakeholders and interested parties to the project activity and to provide a platform from which comments could be gathered. The agenda of the consultation meeting included an introduction and attendance register sign in, a presentation of the project and a questions & answers section followed by a summary /10/.		OK
E.1.2	Have appropriate media been used to invite comments by local stakeholders?	/1/ /30/	DR	Invitation to the meeting was advertised in the local newspaper the Mogol Pos and was supplemented by posters which were on display in a number of locations around Lephalale /30/.		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/ /81/	DR	As confirmed by the DNA /81/, no specific regulations on the stakeholder consultation process are existing in South Africa.		OK
E.1.4	Is a summary of the stakeholder comments received	/1/	DR	A summary of the stakeholder comments		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	provided?	/10/		received /10/ is provided in section E.2 of the PDD. The question & answer session was mainly related to CDM, by-products, operation, technology and electricity generation of the project activity.		
E.1.5	Has due account been taken of any stakeholder comments received?	/1/ /10/	DR	According to the LSC Report /10/, no objections to the project were made.		OK

Table 3 Resolution of corrective action requests and clarification requests

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 1 The project participant is requested to submit the Letter of Approval issued by the DNA of the Republic of South Africa.	A.3.2 A.3.3	The LoA was received on 13/07/2012. Please see DoE, 2012. Letter of Approval (LoA).	The project participant submitted the Letter of Approval issued by the DNA of the Republic of South Africa on 13 July 2012 /57/. Therefore this CAR has been closed.
CAR 2 The project participant is requested to use the latest available versions both of the EB tools and of the EB guidance.	B.1.2 B.5.1 B.5.48	The latest available versions of both the EB tools and of the EB guidance documents have been utilised, including: • Tool to calculate the emission factor for an electricity system (Version 2.2.1, EB 63, Annex 19); • Tool for the demonstration and assessment of additionality (Version 6.0.1, EB 69, Annex 20); • Guidelines on the assessment of investment analysis (Version 05, EB 62, Annex 5) • Guidelines on additionality of first-of-its-kind project activities (Version 01.0, EB 63, Annex 11) • Guidelines on common practice (Version 01.0, EB 63, Annex 12) Also, an applicability analysis for the	The project participant adopted the latest available versions both of the EB tools and of the EB guidance /62//63//64//66//67//68/. Moreover an applicability analysis for the tools has been carried out, as further described in CL 10. Therefore this CAR has been closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		tools has been carried on under section B.1. of the latest version of the PDD, V01.1 in "Table 5" and "Table 6".	
CAR 3 The project participant is requested to comply with Annex 59 of EB 51: "Information note: previous rulings related to the appropriateness of benchmarks for project activities utilizing waste heat/waste gas for power generation" in the benchmark selection of the investment analysis.	B.1.2 B.5.14 B.5.15 B.5.48	In order to comply with "Information note: previous rulings related to the appropriateness of benchmarks for project activities utilizing waste heat/waste gas for power generation (EB 51, Annex 59)", specifically paragraph "9" which states: "For projects in which the electricity was being produced for captive consumption the benchmark of the core business was considered to be appropriate, as the project was considered to be an investment in the operation of the core business." As mentioned throughout the PDD, the electricity produced will be for captive consumption at the recipient facility, Exxaro's Grootegeluk Coal Mine. As such, the financial/ economic indicator utilised is the Internal Rate of Return (IRR), since Exxaro company policy requires the use of IRRs for investment decision making compared to an internal company benchmark based on the weighted average cost of capital	The choice of the financial/economic indicator used in the investment analysis is in compliance with Annex 59 of EB 51: "Information note: previous rulings related to the appropriateness of benchmarks for project activities utilizing waste heat/waste gas for power generation" /70/. Even though the project activity occasionally could deliver some of the electricity to the South African grid, all the electricity generated by the project activity will be used for captive consumption /5/ and DNV confirms that the project participant adopted an after-tax equity benchmark related to the core business. Indeed the default value (11.9%) for the expected return on equity of mining/mineral production (Group 2) in South Africa provided by the Guidelines on the assessment of investment analysis /68/ has been defined as benchmark for the financial evaluation of the proposed project activity. Therefore this CAR has been closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		(WACC). Exxaro's WACC is therefore utilised as an appropriate benchmark. Please also refer to "Exxaro, 2012k" and "Exxaro, 2012l." as referenced in the PDD (V01.1) for a breakdown of the calculation of Exxaro's WACC.	
CAR 4 According to Step 2 of baseline methodology procedure, the project proponents are required to use economic analysis for the identification of the baseline scenario where the CDM waste energy recovery project is implemented in a Greenfield project facility. The investment analysis for the Greenfield projects include the cost of the fuel that would have been used by the recipient facility(ies) in the absence of the CDM project. The fuels for such analysis should include all the fuels available in the host country, including those which can be imported in the host country.	B.4.2 B.4.4 B.4.8	As required, economic (investment) analysis has been utilised to identify the most plausible baseline scenario by eliminating non-feasible scenarios. Accordingly, Step 2 of the baseline scenario identification has been updated to include the costs associated with Scenario 1 (Waste energy would be combusted and vented and power would be supplied from a newly constructed Greenfield coal fired power plant) and Scenario 2 (Waste energy would be combusted and vented and power would be supplied from the national grid). Moreover, with reference to ACE Energy (2012), the investment analysis for the Greenfield coal-fired power plant (Scenario 1) has included the cost of the fuel (coal) utilised by the plant to determine the levelised cost of electricity (LCOE) for the plant.	The analysis made by the project participant with regards to step 1 of the methodology ACM0012 (version 04.0.0) /61/ revealed two realistic and credible scenarios, namely: - Scenario 1: Waste energy would be combusted and vented (W2) and power would be supplied from a newly constructed Greenfield coal fired power plant (P8). - Scenario 2: Waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10). As required by step 2 of the methodology /61/, the project participant identified the most plausible baseline scenario by eliminating non-feasible options. While scenario 1 involves an

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			investment, scenario 2 does not require any investment, in accordance with paragraph 19 of Guidelines on the assessment of investment analysis /68/. The project participant carried out a simple cost analysis adopting as financial indicator the Levelised Cost of Electricity (LCOE). The adopted benchmark is the average annual Eskom tariff for 2011 (48.82 ZARc/kWh). The average annual Eskom tariff for 2011 has been calculated in the Electricity Tariff Calculation spread-sheet /4/, which has been verified by DNV to be correct in accordance with the evidence provided. The input data have been crosschecked with the electricity bill monthly issued by Eskom to Exxaro Resources Limited (Exxaro) during 2011 /9/. The Levelised Cost of Electricity (LCOE) of a greenfield coal fired captive power plant with a capacity of 60 MW is 155.36 ZARc/kWh. The value has been crosschecked with an independent study (Levelised Cost of Electricity – Lephalale Power Plant /8/) based on the result of a Coal fired steam power generation plant comparative

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			cost estimate for a 60MWe plan at Lephalale (Grootegeluk) prepared by an independent third party /7/. In conclusion Scenario 1, which is the combination of waste energy use alternative W2 and power generation alternative P8 is not a plausible scenario to the project activity, since it has been demonstrated that it is a non-feasible option. Indeed it is clearly economically unattractive compared to scenario 2: Waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10). As required by step 2 of the methodology /61/, the investment analysis for the greenfield coal fired captive power plant includes the cost of the fuel (coal) that would have been used by the recipient facility(ies) in the absence of the CDM project. The cost of the fuel is equal to 7.94 ZAR/GJ and it has been crosschecked with an independent study (Levelised Cost of Electricity – Lephalale Power Plant /8/). <u>Therefore this CAR has been closed.</u>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 5 According to the methodology ACM0012 (version 04.0.0) /61/, the project participants are required to use investment analysis for demonstrating additionality where the CDM waste energy recovery project is implemented in a Greenfield project facility. The investment analysis for the Greenfield projects include the cost of the fuel that would have been used by the recipient facility(ies) in the absence of the CDM project. The fuels for such analysis should include all the fuels available in the host country, including those, which can be imported in the host country. The project participant is requested to revise the financial calculation spreadsheet accordingly.	B.5.25 B.5.48	Not applicable (N/a). As demonstrated in the latest version of the PDD (V01.1), Scenario 2 (the continuation of the current situation) is identified as the most plausible baseline scenario.	CAR 5 is no longer applicable since the project participant has demonstrated that the only plausible alternative to the proposed project activity is scenario 2 (Waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10). While the project activity involves an investment, scenario 2 does not require any investment, in accordance with paragraph 19 of Guidelines on the assessment of investment analysis /68/. In accordance with the abovementiond guidelines /68/ and with the Tool for the demonstration and assessment of additionality /62/, the additionality has been demonstrated through a benchmark analysis, as detailed in section 4.9.3 (Investment analysis) of this report. Therefore this CAR has been closed.
CAR 6 The project participant is requested to correct the IRR calculation spreadsheet, since gross and net capacities are not consistent with the PFS. Moreover equity IRR calculation with CER revenues and sensitivity analysis summary are not correct.	B.5.25 B.5.26 B.5.48	The IRR calculation spreadsheet ("Market Coke WHR Project - IRR calcs V1.3") has been corrected to be consistent with the PFS. Also, the IRR sensitivity analysis has been corrected to exclude CER revenues.	The IRR calculation spreadsheet /2/ was received and verified. DNV confirms that the underlying assumptions are appropriate and the financial calculations are correct. The key parameters (Total CAPEX, Total OPEX, Electricity tariff, Electrical

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			output) have been varied to reach the benchmark. The assessment of the likelihood of this to happen is provided in section 4.9.3 (Investment analysis) of this report. Therefore this CAR has been closed.
CAR 7 The project proponent is requested to revise the applicable output range in accordance with the capacity indicated in the Pre-Feasibility Study Report.	B.5.43 B.5.47 B.5.48	The applicable output range has been revised to be in line with the PFS, and the applicable output range of the project activity is 30MW (-50%) to 90MW (+50%) as shown section B.5. and Step 4 carried out therein.	As per the Pre-Feasibility Study Report, the design capacity of steam turbine generators installed in the waste heat recovery plant is 2x30 MW /5/. The project participant carried out a common practice analysis in accordance with the Tool for the demonstration and assessment of additionality /62/. Following the provisions of paragraph 47 of the tool, the applicable output range has been defined to be 30 MW to 90 MW, which correspond to ± 50% of the design capacity of the proposed project activity, as specified in the Pre-Feasibility Study Report /5/. Therefore this CAR has been closed.
CAR 8 The project participant is requested to apply the latest available version of the Tool for the demonstration and assessment of additionality /62/, which includes the requirement of the	B.5.47 B.5.48	As above for CAR 2.	As far as the common practice analysis is concerned, the project participant applied the latest available version of the Tool for the demonstration and assessment of additionality /62/.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
Guidelines on common practice.			According to the Tool for the demonstration and assessment of additionality /62/, the geographical scope of the common practice analysis has been defined as the entire host country (South Africa) as a default. According to the Tool for the demonstration and assessment of additionality /62/, for project activities that involve switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies), a stepwise procedure has to be used to carry out the common practice analysis. In accordance with the tool /62/, the common practice analysis has been carried out following the stepwise procedure described here below: *Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.* As per the Pre-Feasibility Study Report, the design capacity of steam turbine generators installed in the waste heat

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			recovery plant is 2x30 MW /5/. The applicable output range has been defined to be 30 MW to 90 MW, which correspond to ± 50% of the design capacity of the proposed project activity, as specified in the Pre-Feasibility Study Report /5/. *Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step.* The project participant carried out the common practice analysis covering the entire host country (South Africa). According to a sectorial expert opinion /41/, and confirmed by the DNA /81/, in South Africa there are only 3 coke manufacturing plants. These include plants located at: - Vanderbijlpark – 6 coke batteries with gas cleaning and by-product recovery;

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			- Pretoria – 1 coke battery with gas cleaning and by-product recovery; - Newcastle – 3 coke batteries with gas cleaning and by-product recovery. Therefore N_{all} = 3. *Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.* Among the identified coke manufacturing plants, none of them is either of the non-recovery type or the heat recovery type. Therefore all 3 plants apply technologies different that the technology applied in the proposed project activity. Therefore N_{diff} = 3. *Step 4: Calculate factor $F = 1 - N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project*

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			activity. In the case of the proposed project activity: F = 1 – 3/3 = 0 *The proposed project activity is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled:* *(a) the factor F is greater than 0.2, and* *(b) N_{all}-N_{diff} is greater than 3.* In the case of the proposed project activity: (a) F = 0 (b) N_{all}-N_{diff} = 0 Therefore the proposed project activity is not a "common practice" within the coal sector in South Africa. The common practice analysis has been correctly conducted according to the provisions of the Tool for the demonstration and assessment of additionality /62/. Therefore this CAR has been closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 9 According to the methodology ACM0012 (version 04.0.0) /61/, the quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y (**$EG_{i,j,y}$**) is a parameter to be monitored, not a parameter to be fixed ex-ante.	B.6.1	The quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have been sourced from source *i* (the grid) during the year *y* ($EG_{i,j,y}$) has been included as a parameter to be monitored under section B.7. of the latest version of the PDD (V01.1).	The project participant removed the quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y (**$EG_{i,j,y}$**) from the list of parameters to be fixed ex-ante. **$EG_{i,j,y}$** will be measured continuously using electricity meters. The meter readings will be aggregated monthly for use in the monitoring report. The information will be monthly saved onto Exxaro's Supervisory Control and Data Acquisition (SCADA) system. The electricity meters will be calibrated and maintained according to the manufacturer's specifications. Therefore this CAR has been closed.
CAR 10 Methodology ACM0012 (version 04.0.0) /61/ requires the parameter "Abnormal operation of the project facility including emergencies and shut down" to be monitored. The project participant is requested to comply with the above mentioned methodological requirement.	B.7.1	The parameter "Abnormal operation of the project facility including emergencies and shut down" has been included as a parameter to be monitored under section B.7. of the latest version of the PDD (V01.1). Also, a description of examples of abnormal operation has been included in the parameter table.	The project participant included the Abnormal operation of the project facility including emergencies and shut down in the list of parameters to be monitored, as required by the methodology ACM0012 (version 04.0.0) /61/. This parameter has to be monitored to demonstrate that no emission reduction is claimed for the hours during the

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			abnormal operation of the part of project facility which have impact on waste energy generation and recovery. The abnormality can be in terms of violation of operational parameters, poor quality product, emergencies or shutdown. According to the PDD, the hours of abnormal operation of parts of project facility that can have an impact on waste energy generation and recovery will for example related to: • High COFG temperature: Temperature measurement after tertiary combustion • Low COFG temperature: Temperature measurement after tertiary combustion • Low COFG flow: COFG pressure at WHRB inlet and ID fan speed at the WHRB outlet This parameter will be monitored daily and aggregated annually. <u>Therefore this CAR has been closed.</u>
CL 1 The project proponent is requested to clearly describe in the PDD the implementation status of both the project facility and the	A.2.2	Section A.2. of the latest version of the PDD (V01.1) has been updated to include a description of the implementation status of both the	The project participant clarified that the project facility is currently at the Bankable Feasibility Study (BFS) phase and the potential to generate electricity

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
project activity. Moreover the project participant is requested to demonstrate that the investment decision to proceed with the implementation of the project facility is independent from the implementation of the project activity (i.e. the project facility has to be financially attractive also without the implementation of the project activity).		project facility and the project activity. Please also refer to "Exxaro, 2012a" for a letter demonstrating that the investment decision to proceed with the implementation of the project facility is independent from the implementation of the project activity, due to the need for the revenues from the sale of CERs to make the project activity more financially attractive.	from waste heat recovered in the Market Coke Waste Heat Recovery Plant (the project activity) is being investigated through the completion of a Pre-feasibility Study (PFS) /5/. As confirmed by a letter signed by the carbon manager of Exarro Resources Limited (Exxaro) /13/ and discussed during the site visit /82//83/, the project activity and the project facility will independently seek approval from Exxaro's Board of Directors due to the need for carbon revenue for the project activity. The project participant clarified and documented) /5//13/ the implementation status of both the project facility and the project activity. Therefore this CL has been closed.
CL 2 The project proponent is requested to clearly describe the primary, secondary and tertiary combustion. Moreover Figure 4 of the PDD has to include an acronym legend and a legend describing each stream flow, clearly define the position of the tertiary combustion in the process and delimitate the project's system boundaries.	A.2.4	The primary, secondary and tertiary combustion has been clearly described in section A.4.3. of the latest version of the PDD (V01.1). Also, please not that Figure 4 is now "Figure 5" in the latest version of the PDD (V01.1) and "Figure 6" has been included to define the position of the primary, secondary and tertiary combustion processes, delimitating the project's system	According to the project facility process description provided in the PDD, the primary air is introduced, mainly through ports in the coke oven doors, to initiate the partial combustion reaction that provides the heat to liberate the first volatiles from the coal (primary combustion). This partially combusted gas is drawn into channels in the oven floor where secondary combustion air is

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		boundaries.	added which oxidizes most of the volatiles to provide sustained heat for the coking process (secondary combustion). The amount of secondary air added in controlled to regulate the oven temperature and is sub-stoichiometric to prevent overheating. The final flue gas leaving the coke oven via the overhead ducts, thus still contains combustible components (CO and H_2 gas) which is oxidized (for safety and environmental reasons) by the addition of tertiary combustion air, in excess of the stoichiometric requirement, outside the oven (tertiary combustion). The project participant clearly described the primary, secondary and tertiary combustion. Moreover a new process flow diagram (figure 6) has been included in the PDD. The abovementioned figure has acronym legend and a legend describing each stream flow, it clearly defines the position of the tertiary combustion in the process and delimitates the project's system boundaries. Therefore this CL has been closed.
CL 3	A.2.4	A general layout of the project activity	The project participant included a

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
The project participant is requested to update the general layout of the plant annexed to the Pre-feasibility Study Report (dwg 6767-000-B15-104-00-00) and to insert the revised version in the PDD /5/.		has been included a "Figure 3" in section A.4.1.4. of the latest version of the PDD (V01.1). Please also refer to "Exxaro, 2012b" for the general layout figure.	revised layout of the project facility and activity in the PDD (figure 3). DNV verified that the revised layout is consistent with the layout of the site observed during the site visit /82/. Therefore this CL has been closed.
CL 4 The project participant is requested to clarify the inconsistencies between section A of the PDD (in particular Table 3) and the Pre-feasibility Study Report /5/. Moreover the project participant is requested to define in the above mentioned table the nominal capacity of the two generators in MW and to describe the thermodynamic conditions of the Waste Energy Carrying Medium at the Waste Heat Recovery Boiler inlet and outlet.	A.2.4 B.5.19 B.5.48	"Table 3" of the latest version of the PDD (V01.1) has been updated to be consistent with the PFS, including the nominal capacity of each of the two generators in MW. Also, the thermodynamic conditions of the waste heat at the WHRB inlet and outlet has been described in "Table 1" of the latest version of the PDD (V01.1).	The project participant revised section A of the PDD, which is now consistent with the Pre-feasibility Study Report /5/. At this stage, the capacity of each of the two electric generators has been defined to be 30 MW_{el}. This capacity may slightly vary in a later stage of the project implementation, depending on the actual waste heat available downstream the project facility. The project participant provided in table 1 of the PDD the thermodynamic conditions of the Waste Energy Carrying Medium at the Waste Heat Recovery Boiler inlet. The abovementioned thermodynamic conditions have been sourced from the Pre-feasibility Study (PFS) /5/. According to DNV sectorial competence they are feasible within the project design.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			Therefore this CL has been closed.
CL 5 The project participant is requested to clarify which point of measurement the coordinates of the project activity are referring to.	A.4.1	As above for CL 3, "Figure 3" in section A.4.1.4. of the latest version of the PDD (V01.1) includes a reference to the coordinates for the project (23.6453° South and 27.5544° East) and refer to point "R9" of "Figure 3".	The project participant clarified that the project coordinates included in the PDD (23°64'53'' South and 27°55'44'' East) are corresponding to the north eastern corner of the WHR power plant (point R9 in the layout of the project activity and facility provided in the PDD). The coordinates were verified by DNV validation team during the site visit. Therefore this CL has been closed.
CL 6 The project participant is requested to provide evidence that ODA or public funding has not and will be not used in the development and implementation of the project.	A.5.1	Please refer to section A.4.5. of the latest version of the PDD (V01.1) as well as "Exxaro, 2012c."	As confirmed by a letter signed by the carbon manager of Exarro Resources Limited (Exxaro) /14/, official development assistance or public funding has not and will be not be used in the development and implementation of the Market Coke WHR Plant. Therefore this CL has been closed.
CL 7 The project participant is requested to provide evidence that in the absence of the project activity the WECM stream would neither be recovered nor partially be recovered and therefore would be flared, released to atmosphere, or remain unutilized.	B.2.2 B.2.6	As can be seen from "Exxaro, 2012d." and "Exxaro, 2012e.", none of the current operations at the recipient facility, the Grootegeluk Coal Mine, have the potential to utilise the waste heat, partially or in full, generated by the proposed Market Coke Plant (the	As confirmed by a letter signed by Grootegeluk Coal Mine manager /15/ and verified during the site visit /82/, Grootegeluk Coal Mine currently produces various types of coal which is supplied to the local and international markets. The pit is an open cast

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		project facility) and therefore the waste heat from the coke ovens would remain unutilised.	operation and uses the typical shovel and truck method of mining. Once the coal is mined, dependent on the type of coal, it is washed at one of 6 beneficiation plants situated on the site. These plants are typical cyclone equipped plants. None of the above operations have the potential to utilise the waste heat, partially or in full, generated by the proposed Market Coke Plant and therefore the waste heat from the coke ovens would remain unutilised. Moreover as confirmed by a letter signed by Reductants Business Unit Manager of Exarro Resources Limited (Exxaro) /16/ and verified during the site visit /82/, the char plant situated at Grootegeluk Coal Mine does not have the potential to utilise the waste heat, partially or in full, generated by the proposed Market Coke Plant and therefore the waste heat from the coke ovens would remain unutilised. DNV has therefore enough elements to conclude that in the absence of the project activity the WECM stream would neither be recovered nor partially be recovered and therefore would be flared, released to atmosphere, or remain unutilized.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			Therefore this CL has been closed.
CL 8 The project participant is requested to provide evidence of the operational lifetime of the waste energy generation equipment and to determine the remaining lifetime of the equipment using the latest version of the "Tool to determine the remaining lifetime of equipment".	B.2.8	The latest version of the "Tool to determine the remaining lifetime of equipment system (Version 01, EB 50, Annex 15)", is not considered to be applicable for use in the project activity or project facility since both are greenfield projects and have no existing equipment. Since, the "Scope and Applicability" of the tool mentions that the "tool may, for example, be used for project activities which involve the replacement of existing equipment with new equipment or which retrofit existing equipment as part of energy efficiency improvement activities". As such the tool is not considered applicable or necessary for use. Please refer to "MEPC, 2011." (page 11/95) for evidence of the operational lifetime of the waste energy generation equipment.	The operational lifetime of the waste energy generation equipment is over 25 years, as confirmed by the Technical Proposal for the Market Coke Plant /31/ issued by a Chinese contractor. The project participant clarified that the Tool to determine the remaining lifetime of equipment /64/ is not applicable for the determination of the remaining lifetime of the waste energy generation equipment since both the project facility and activity are greenfield. Therefore this CL has been closed.
CL 9 The project participant is requested to clarify how the proposed project activity complies with the following applicability criterion: "The extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity will be	B.2.9	The extent of use of waste energy from the waste energy generation facility in the absence of the project activity is determined according to Annex 1 (since the project facility is a Greenfield plant) of the methodology. As can be seen from section B.4. of the PDD as well as	As assessed in Criterion 2 of the applicability conditions of the methodology /61/, the project facility is a Greenfield waste heat generating facility. Therefore, the extent of use of waste energy for electricity generation from

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
determined in accordance with the procedures provided in Annex 1 (for Greenfield project facilities) and in Annex 2 (for existing project facilities) to this methodology." 		the analysis carried out thereunder, the identified baseline scenario is where waste energy would be combusted and vented and power would be supplied from the national grid and ACM0012 is therefore suitable for use.	the waste energy generation facilities in the absence of the CDM project activity has been determined in accordance with the procedures provided in the Annex 1 to the methodology ACM0012 version 4.0.0 /61/. The assessment of the application of Annex 1 is provided at the end of paragraph 4.5 of this validation report. <u>Therefore this CL has been closed.</u>
CL 10 The project participant is requested to demonstrate how the proposed project activity complies with the following applicability criterion: "In addition, the applicability conditions included in the tools referred to above apply."	B.2.10	As above for CAR 2, an applicability analysis for the tools has been carried on under section B.1. of the latest version of the PDD, V01.1, in "Table 5" and "Table 6".	As further described in section 4.5 (Application of selected baseline and monitoring methodology) of this report, the project participant discussed the applicability of some of the tools referred in the methodology ACM0012 (version 04.0.0) /61/: • Tool for the demonstration and assessment of additionality /62/ • Tool to calculate the emission factor for an electricity system /63/ The applicability of the following tools was not discussed, since they are not used in the validation of the proposed project activity: • Tool to determine the baseline efficiency of thermal or electric

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			energy generation systems; • Tool to determine the remaining lifetime of equipment; • Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion Therefore this CL has been closed.
CL 11 The project participant is requested to further substantiate the elimination of all non-plausible options within step 1 of the methodology by providing relevant evidences.	B.4.2 B.4.4 B.4.5 B.4.7 B.4.8 B.5.11 B.5.12 B.5.13 B.5.48	As above for CL 7, the elimination of all non-plausible options within Step 1 of the identification of the baseline scenario carried out under section B.4. in "Table 9" and "Table 10" has been substantiated in the latest version of the PDD (V01.1) with relevant evidences. As above for CAR 4 and CAR 5, the elimination of alternative P8 has been substantiated using economic (investment) analysis as carried out in Step 2 of section B.4. of the latest version of the PDD (V01.1).	As further described in section 4.7 (Baseline scenario identification and description) of this report, the project participant further substantiated the elimination of all non-plausible options within step 1 of the methodology by providing relevant evidences. Therefore this CL has been closed.
CL 12 The project participant is requested to provide evidence of past, present and future electricity demand of the Grootegeluk Coal Mine.	B.4.2 B.4.4 B.4.8	Please refer to "Grootegeluk Annual GWh forecast 2012-03".	The project participant provided the Grootegeluk annual GWh forecast /17/, showing the past, the present as well as the future electricity consumption of the Grootegeluk mine. The electricity consumption was 230 GWh/year in 2005, 256 GWh/year in 2011 and it is expected to increase

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			rapidly up to 538 GWh/year in 2016, when the project activity is expected to start operations. The future increase of electricity consumption is mainly due to the installation of the project facility and to the operation of a new facility feeding the close Eskom coal power plant currently under construction /82//83/. Therefore this CL has been closed.
CL 13 The project participant is requested to further demonstrate that the alternative P8 is not a plausible alternative to the project activity.	B.4.2 B.4.4 B.4.8 B.5.11 B.5.12 B.5.13 B.5.48	As above for CAR 4, CAR 5 and CL 11, the elimination of alternative P8 has been substantiated using economic (investment) analysis as carried out in Step 2 of section B.4. of the latest version of the PDD (V01.1).	The analysis made by the project participant with regards to step 1 of the methodology ACM0012 (version 04.0.0) /61/ revealed two realistic and credible scenarios, namely: - Scenario 1: Waste energy would be combusted and vented (W2) and power would be supplied from a newly constructed Greenfield coal fired power plant (P8). - Scenario 2: Waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10). As required by step 2 of the methodology /61/, the project participant identified the most plausible

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			baseline scenario by eliminating non-feasible options. While scenario 1 involves an investment, scenario 2 does not require any investment, in accordance with paragraph 19 of Guidelines on the assessment of investment analysis /68/. The project participant carried out a benchmark analysis adopting as financial indicator the Levelised Cost of Electricity (LCOE). The adopted benchmark is the average annual Eskom tariff for 2011 (48.82 ZARc/kWh). The average annual Eskom tariff for 2011 has been calculated in the Electricity Tariff Calculation spread-sheet /4/, which has been verified by DNV to be correct in accordance with the evidence provided. The input data have been crosschecked with the electricity bill monthly issued by Eskom to Exxaro Resources Limited (Exxaro) during 2011 /9/. The Levelised Cost of Electricity (LCOE) of a greenfield coal fired captive power plant with a capacity of 60 MW is 155.36 ZARc/kWh. The value has been crosschecked with an

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			independent study (Levelised Cost of Electricity – Lephalale Power Plant /8/) based on the result of a Coal fired steam power generation plant comparative cost estimate for a 60MWe plan at Lephalale (Grootegeluk) prepared by an independent third party /7/. In conclusion Scenario 1, which is the combination of waste energy use alternative W2 and power generation alternative P8 is not a plausible scenario to the project activity, since it has been demonstrated that it is a non-feasible option. Indeed it is clearly economically unattractive compared to scenario 2: Waste energy would be combusted and vented (W2) and power would be supplied from the national grid (P10). Therefore this CL has been closed.
CL 14 The project participant is requested to further demonstrate that the alternatives W4 and W6 are not plausible alternatives to the project activity, taking into consideration the steam needs of the char plant located nearby the project activity.	B.4.2 B.4.4 B.4.8 B.5.11 B.5.12 B.5.13 B.5.48	As above for CL 7 and CL 11 and with reference to “Exxaro, 2012d.” and “Exxaro, 2012e.”, none of the existing operations at the Grootegeluk Coal Mine (the recipient facility) have the potential to utilise the waste energy for meeting their energy demand, therefore W4 is not a realistic and credible alternative. The use of the waste energy	As confirmed by a letter signed by Grootegeluk Coal Mine manager /15/ and verified during the site visit /82/, Grootegeluk Coal Mine currently produces various types of coal which is supplied to the local and international markets. The pit is an open cast operation and uses the typical shovel and truck method of mining. Once the

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		for export electricity generation would require a project similar to the proposed project activity, and is therefore not considered to be a realistic and credible alternative for the use of waste energy in the absence of the project activity. W6 is thus excluded as a realistic and credible alternative to the project activity.	coal is mined, dependent on the type of coal, it is washed at one of 6 beneficiation plants situated on the site. These plants are typical cyclone equipped plants. None of the above operations have the potential to utilise the waste heat, partially or in full, generated by the proposed Market Coke Plant and therefore the waste heat from the coke ovens would remain unutilised. Moreover as confirmed by a letter signed by Reductants Business Unit Manager of Exarro Resources Limited (Exxaro) /16/ and verified during the site visit /82/, the char plant situated at Grootegeluk Coal Mine does not have the potential to utilise the waste heat, partially or in full, generated by the proposed Market Coke Plant and therefore the waste heat from the coke ovens would remain unutilised. Therefore alternative W4 – Waste energy is used for meeting energy demand at the recipient facility(ies) – is not a realistic and credible alternative. Alternative W6 – All the waste energy produced at the facility is captured and used for export electricity generation or steam – is not a realistic and credible

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			alternative since: • exportation of electricity generation would involve a project similar to the proposed project activity, which is not financially attractive, as further described in section 4.9.3 (Investment analysis) of this report • exportation of steam is not realistic, since the recipient facility is not requiring any additional thermal energy (as discussed in alternative W4) and, as verified during the site visit, there are no other facilities outside the Grootegeluk Coal Mine that could use the exported steam. Therefore this CL is closed.
CL 15 The project proponent are requested to provide evidence of the health, safety and environmental legislation according to which the waste gas would need to be combusted and vented.	B.4.6 B.4.8 B.5.2 B.5.48	Please refer to section B.4. and "Table 9" of the latest version of the PDD (V01.1), as well as "Department of Environmental Affairs (DEA), 2010. National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA) – Government Notice No. 248 (GN 248 of 31 March 2010)."	As confirmed in the National Environment Management: Air quality act (2004) /32/, the waste gas generated in the ovens of market coke plant would need to be combusted and vented prior to release it to the atmosphere. As also confirmed by the DNA /81/, the baseline scenario is in accordance with all mandatory laws and regulations.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			Therefore this CL is closed.
CL 16 The project participant is requested to indicate the evidences of all the events listed in the table providing the timeline for the proposed project activity. Moreover the project participant is requested to submit the above mentioned evidences.	B.5.5 B.5.48	Section B.5. and "Table 12" of the latest version of the PDD (V01.1) have been updated with evidences of all the events listed in the table providing the timeline for the proposed project activity.	Prior to the validation, the following activities were carried out: • On June 2010 the project initiated as PFS /34/; • On 1 February 2011 the PFS was completed /5/; • On 8 March 2011 a tender was issued for CDM consulting services /18/; • On 4 April 2011 an Environmental impact assessment (EIA) consultant was appointed /35/; • On 9 June 2011 Camco was appointed as CDM consultant /36/; • On 27 June 2011 the Prior Consideration Notice was submitted to the CDM Executive Board (EB) /71/; • On 28 June 2011 the DNA of South Africa notified the receipt of the Prior Consideration Notice /40/; • On 6 September 2011 the project participant submitted the PIN to the DNA of South Africa /19/;

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			• On 28 September 2011 a Letter of No Objection was issued by the DNA of South Africa /37/; The project participant submitted all the required evidence which were verified by DNV to be appropriate. <u>Therefore this CL is closed.</u>
CL 17 Since the data used in the investment analysis are more than 1 year old, the project participant is requested to demonstrate that the values adopted in the investment analysis, including the benchmark, are still valid at the time of this validation.	B.5.14 B.5.19 B.5.48	Since the benchmark applied is the default value for the expected ***real*** return on equity for different project types and host countries as provided in the "Guidelines on the assessment of investment analysis (Version 05, EB 62, Annex 5)", the data and values applied are conservative and compatible with an investment analysis in real terms.	In the revised PDD, the default value (11.9%) for the expected return on equity of mining/mineral production (Group 2) in South Africa provided by the Guidelines on the assessment of investment analysis /68/ has been defined as benchmark for the financial evaluation of the proposed project activity. Moreover the investment analysis has been carried out in real terms. While the adopted value of the electricity tariff has been increased by the NERSA Review Eskom's Tariffs for the Period 1 April 2012 to 31 March 2013 (16%) /75/, the investment costs sourced from a Prefeasibility Study Report /5/ dated February 2011 have not been updated to 2012. DNV deems this approach to be conservative, since an update of the investment costs would have require the project participant to

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			take into account the inflation for the period 2011-2012. This would have resulted in an increase of the investment cost and therefore in a lower IRR. Therefore this CL is closed.
CL 18 The project participant is requested to provide evidence of the selected operational lifetime of the project activity.	B.5.18 B.5.48 C.1.3	Please refer to "Prana Energy, 2012a".	The operational life time of the project activity is 20 years as confirmed by both the Pre-Feasibility Study Report /5/ and by an estimation made by a local engineering company /25/. It is DNV opinion that the selected operational time is reasonable and confirmed by proper evidences. Therefore this CL is closed.
CL 19 The project participant is requested to clarify why neither salvage value nor working capital have been included as a cash inflow in the last year of operation.	B.5.18 B.5.48	Pl Please refer to "Prana Energy, 2012a" for a determination of the salvage value of major equipment, as included in the latest version of the IRR calculation spreadsheet (V1.3).	The IRR calculation is taking into account a salvage value of 5% of the investment cost of the waste heat recovery boiler and of the turbines at the end of the investment period /2/. The adopted salvage value has been confirmed by a local engineering company /25/. It is DNV opinion that the selected salvage value is reasonable and confirmed by proper evidences.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			Therefore this CL is closed.
CL 20 The project participant is requested to provide evidence of all input data of the investment analysis, as indicated during the site visit.	B.5.21 B.5.23 B.5.24 B.5.48	All input data utilised in the calculation of the IRR has been referenced with the required evidence. Please see "Market Coke WHR Project - IRR calcs V1.3".	The project participant provided appropriate evidence of all input data of the investment analysis. A detailed description of all input values is provided in section 4.9.3 (Investment analysis) of this report. Therefore this CL is closed.
CL 21 The project participant is requested to provide evidence that the range of variations in the sensitivity analysis is reasonable in the project context.	B.5.27 B.5.48	The range of variations (-10% +10%) utilised in the sensitivity analysis is in line with the "Guidelines on the assessment of investment analysis (Version 05, EB 62, Annex 5)" and specifically paragraph 21 which states that "as a general point of departure variations in the sensitivity analysis should at least cover a range of +10% and 10%, unless this is not deemed appropriate in the context of the specific project circumstances."	The range of variations in the sensitivity analysis is in line with the requirement of paragraph 21 of the Guidelines on the assessment of investment analysis /68/. Moreover the key parameters (Total CAPEX, Total OPEX, Electricity tariff, Electrical output) have been varied to reach the benchmark. The assessment of the likelihood of this to happen is provided in section 4.9.3 (Investment analysis) of this report. In conclusion it is DNV opinion that the range of variations in the sensitivity analysis is reasonable in the project context. Therefore this CL is closed.
CL 22 The project proponent is requested to indicate in the PDD the data sources used in the	B.5.44 B.5.45 B.5.46	Please refer to "CNI Technologies, 2012. Coke Making Facilities in South Africa." As referenced in section B.5. of	Data sources used in the common practice analysis has been indicated in the PDD.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
common practice analysis (i.e. According to the PDD, in South Africa there are currently no plants that deliver the same output or capacity as the proposed project activity.)	B.5.47 B.5.48	the PDD (V01.1).	According to a sectorial expert opinion /41/, and confirmed by the DNA /81/, in South Africa there are three coke plants using coke batteries with the by product recovery technology. However there are no coke batteries of the heat-recovery type in operation in South Africa. Therefore this CL is closed.
CL 23 The project participant is requested to clarify how the electricity delivered to the grid and not supplied to the recipient j will be measured.	B.7.2	Please refer to "Exxaro, 2012m."	The project participant submitted a single line diagram of Grootgeluk coal mine 33 kV substation /33/ indicating that bidirectional meters will be installed in the outgoing feeders of the substation to measure the electricity delivered to the grid and not supplied to the recipient facility. Moreover section B.7.3 of the PDD, a metering diagram is provided, showing the location of all the meters relevant to the proposed project activity. Therefore this CL is closed.
CL 24 The project participant is requested to submit a single line diagram of the electricity network in the Grootegeluk Coal Mine, indicating where all the electricity meters relevant to the project activity will be	B.7.2	As above for CL 23, please refer to "Exxaro, 2012m."	See assessment of CL 23 here above. Therefore this CL is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
installed.			
CL 25 The project participant is requested to clarify how the proposed starting date fulfils the requirements indicated in the Glossary of CDM terms /69/.	C.1.2	The proposed starting date has been updated in the latest version of the PDD (V01.1) to fulfil the requirements indicated in the Glossary of CDM terms.	The starting date of the proposed project activity is the expected construction contract signing date, which is expected to be 30 June 2013. During the site visit the project participant confirmed that no commitment to expenditures related to the implementation or related to the construction of the project activity has been taken so far /82//83/. The above was confirmed also by the DNA /81/. The starting date is therefore in accordance with the definition indicated in the Glossary of CDM terms /69/, since it is the earliest date at which either the implementation or construction or real action of a project activity will begin. Therefore this CL is closed.
CL 26 The project participant is requested to provide evidence of the approval of the Environmental Scoping Report.	D.1.1	Please refer to "Limpopo Department of Economic Development, Environment & Tourism (LEDET), 2011."	The Environmental Scoping Report relevant to the proposed project activity has been submitted to the Department of Economic development, Environment & Tourism of Limpopo Provincial Government on 18 April 2012 /38/. The authority has underlined the fact that the activity must not commence prior to an environmental authorization being

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			granted by the Department of Economic development, Environment & Tourism. The Environmental Scoping Report has been accepted by Department of Economic development, Environment & Tourism of Limpopo Provincial Government on 24 May 2012 /39/. As required by local regulations and confirmed by the DNA /81/, after the acceptance of the Environmental Scoping Report, the project participant will proceed with an Environmental Impact Assesment. As required by FAR 1 raised in this report, at the time of the first verification the project participant is requested to provide evidence of the approval of the Environmental Impact Assessment relevant to the proposed project activity. <u>Therefore this CL is closed.</u>
CL 27 The project participant is requested to clarify the reason of a step-variation of the variable OPEX for the period years 1-3 and 4-20. The clarification has to consider the fact that the contingencies for year 4-20 are currently calculated on the variable OPEX for years 4-20.	Raised after DVR	The step variation of the Variable OPEX is due to the increase in the water price expected from years 4 – 20. The increase in water price is due to the need to upgrade water infrastructure as a result of the general water scarcity in the area and also growing demand. The Department of Water Affairs (DWA)	The variable OPEX and in particular the water cost is expected to grow from an initial value valid only for the first three years of operation. The increase of the water tariff was confirmed by summary of a meeting held by Trans-Caledon Tunnel Authority (TCTA) for Eskom and Exxaro Resources Ltd regarding a

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		has subsequently embarked on investigations in the Lephalale area to determine water availability and to establish water supplies to meet water demand. As such, the DWA designed the Mokolo and Crocodile River (West) Augmentation Project (MCWAP) as a multi-purpose project incorporating both economic and social development objectives to cater for such growing water demands. The MCWAP entails both the optimal utilisation of local water resources and the transfer of surplus return flows from the Crocodile River (West) and Vaal River Catchments. The Trans-Caledon Tunnel Authority (TCTA) has been appointed by the DWA as the MCWAP implementing agency. As can be seen in the document "MCWAP-1 Tariff Setting for 2013/14", the TCTA has calculated an indicative tariff for phase 1 of the MCWAP (MCWAP-1) at R10.74/m^3 (see slide 22), which has been utilised by Prana Energy as the water cost up to the end of year 3 for the project activity. However, as indicated on slide 10 of the document, phase 2 of the MCWAP	multi-purpose project incorporating both economic and social development objectives to cater for a growing water demands in the Lephalale area /43/. Therefore this CL is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		(MCWAP-2) is likely to be included in the water tariff going forward once input parameters for MCWAP-2 are finalised. Additionally, as mentioned on slide 10, the actual construction costs related to MCWAP-1 will only be known in 2013, and are likely to also vary. The potential also exists for the "marginal tariff" cost as shown on slide 10 to also be incurred. Thus, water costs from years 4-20 will include water tariffs for MCWAP-1 as well as for MCWAP-2 with water tariffs for MCWAP-2 expected to be in line with those for MCWAP-1 and an additional cost potentially incurred through the marginal tariff. Therefore the water costs utilised for the project activity are considered to be conservative given the information available to Exxaro at present and are moreover likely to increase.	
CL 28 The project participant is requested to clarify why the depreciation of Hard Capex is different for major equipment and for other equipment. Moreover the project participant is requested to justify the applicability of the relevant evidences provided (SARS: Deduction in respect of assets used by	Raised after DVR	Major equipment has been depreciated in accordance with Section 12C ("Deduction in respect of assets used by manufacturers or hotelkeepers and in respect of aircraft and ships, and in respect of assets used for storage and packing of agricultural products.") of the Income Tax Act (Act No. 58 of	The project participant clarified that the major equipment are considered to be in line with the definitions and prescriptions of "machinery or plant" under Section 12C of the Income Tax Act (Act No. 58 of 1962, as amended) /27/ and include the Waste Heat Recovery Boilers, Turbines, Cooling

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
manufacturers or hotelkeepers and in respect of aircraft and ships, and in respect of assets used for storage and packing of agricultural products, dated 21 November 2011 and SARS: Deduction in respect of certain pipelines, transmission lines and railway lines, dated 21 November 2011) to the project activity.		1962, as amended) while other equipment has been depreciated in accordance with Section 12D ("Deduction in respect of certain pipelines, transmission lines and railway lines." of the Income Tax Act (Act No. 58 of 1962, as amended). Major equipment is considered to be in line with the definitions and prescriptions of Section 12C, specifically paragraph "(a)" which states: "*(a) machinery or plant… used by him directly in a process of manufacture*" Subsection "1(c)(i)" goes on to state that: "*(c) any new or unused machinery or plant referred to in paragraph (a) of this subsection or improvement referred to in paragraph (h) of this subsection, is or was – (i) acquired by the taxpayer under an agreement formally and finally signed by every party to the agreement on or after 1 March 2002;… the deduction under this subsection shall be increased to 40 per cent of the cost to that taxpayer of that machinery, plant or improvement in respect of the year of assessment during which the plant, machinery or improvement was*	system and Demineralized water plant. Moreover the other equipment are considered being in line with the definitions and prescriptions of "affected asset" under Section 12D of the Income Tax Act (Act No. 58 of 1962, as amended) /28/ and include Piping, Civil's and earthworks, Electrical works and Utilities. Therefore this CL is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		or is so brought into use for the first time and shall be 20 per cent in each of the three subsequent years of assessment." Thus, major equipment considered to be in line with the definitions and prescriptions of "machinery or plant" under Section 12C of the Income Tax Act (Act No. 58 of 1962, as amended) include the Waste Heat Recovery Boilers, Turbines, Cooling system and Demineralised water plant. For other equipment, Section 12D indicates that: "*For the purposes of this section –* *"affected asset" means any –* *(aA) pipeline for the transportation of water used by power stations in the process of generating electricity;* *(b) line or cable used for the transmission of electricity; …* *and includes any earthworks or supporting structures forming part of such pipeline, transmission line or cable or railway line and any improvement to such pipeline, transmission line or cable or railway line;*" Subsection "(3)" further states that: "*(3) The allowance contemplated in subsection (2) shall not for any one year*	

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		exceed – *(a) 10 per cent of the cost incurred in respect of any asset contemplated in paragraph (a) of the definition of "affected asset"; or* *(b) 5 per cent of the cost incurred in respect of any asset contemplated in paragraph (aA), (b), (c) or (d) of the definition of affected asset.*" Therefore, other equipment considered being in line with the definitions and prescriptions of "affected asset" under Section 12D of the Income Tax Act (Act No. 58 of 1962, as amended) include Piping, Civil's and earthworks, Electrical works and Utilities. Please note that Buildings have been excluded from the depreciation calculation as Buildings are considered not to be in line with the definitions and prescriptions of "affected asset" under Section 12D and this has been reflected in the updated IRR calculation spreadsheet ("Market Coke WHR Project - IRR calcs V1.4"). Please also note the slight decrease in the IRR reflecting this change. The PDD has accordingly been updated to reflect the amendment to the IRR.	

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
FAR 1 At the time of the first verification the project participant is requested to provide evidence of the approval of the Environmental Impact Assessment relevant to the proposed project activity.	D.1.1	The Environmental Impact Assessment (EIA) Record of Decision (RoD) will be provided at the first Verification.

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APPENDIX B

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

Validation team members

Giovanni Tenderini

Holds a master degree in Energy Engineering focused on energy generation and conversion. He gained his three years professional experience in the power sector where he became familiar with International Financing Institutions project implementation methodologies (ADB, WB, IBRD, EBRD and other international banks) for organization and management of tender procedures for the award of engineering services and construction in the field of hydro and thermal power plants.

Moreover, as Power Engineer he has been in charge of the electro-mechanical design review, construction supervision, preparation of due diligences, feasibility studies, technical specifications and cost estimate of power generation projects mainly located in the Middle East area.

The current Project Manager position involves executing and managing CDM/JI validation and verification assignments, executing and managing verification under voluntary schemes, and providing global support and training in the relevant specialized technical areas within the DNV global Climate Change Services team.

His qualification, industrial experience and experience in CDM demonstrate his sufficient financial expertise and sectoral competence in thermal energy generation from fossil fuels and biomass including thermal electricity from solar, energy generation from renewable energy sources and electricity distribution.

Jan Van Evercooren

Holds a PhD Degree in Chemistry. Having an overall experience of around 40 years. Prior to joining DNV having 4 year experience in iron and steel industry covering sampling & analysis of solid bulk materials and assessment of their quality as raw material for pig iron and steel. Also having more than 25 year experience in environmental consulting in various technical areas covering set-up of air pollutant emission inventories, air pollutant emission & immission measuring, air pollution dispersion modelling and environmental impact assessment (EIA) . Acknowledgment for actually 20 years as Flemish EIA expert in the domains air pollution and climatological effects.

He has experience of around 5 years in validation and verification of CDM/JI projects and other 3rd party validation/verification services.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in Energy Generation from renewable energy sources, MI: Iron and Steel, Metal production, GHG capture and destruction and Waste handling and disposal.

Francisco Zamarron

Holds a 6 year Diploma in Civil Engineering and a 2 year post-graduated Master in Business Administration. He has an overall working experience of around 25 years.

Before joining DNV in 1996 he has worked as a Project Manager in the construction sector, Business Developer Manager in process automation sector mainly for the oil and gas industry and Management Consultant for small and medium organizations. From 1996 until 2005 he has conducted, on behalf of DNV, third party Management System Audits against ISO 9001,

ISO 14001, EMAS and ISO 14044 Standards in a large spectrum of industrial and service sectors.

Technical Reviewers

O. A. Flagstad

Holds a Master Degree in thermodynamics/energy efficiency and has an overall working experience of around 20 years. He has worked both in public and private sector, including 5 years with a research institute (IFE) where specific responsibilities included running an energy efficiency network in the food industry and direct intervention with the industry. Other work experience includes working in European research programmes, administering national research programmes and International Energy Agency annexes.

Ole Andreas Flagstad has more than 5 year experience in validation and verification of projects within CDM, JI and other carbon credit schemes. His qualifications and experience in carbon credit schemes (primarily CDM and JI), qualifies him for different roles in a broad group of technical areas.

L. Nemecek

Holds a MSc. Degree in Energy industries and has an overall experience of around 35 years. Prior to joining DNV he had 32 year experience in nuclear, hydro, fossil-fuelled power and other renewables. He worked for large and medium size energy companies in different roles and capacities including project management, project engineering and consulting. He has acquired his experience in energy industry markets from both Subcontractor and Client Company's perspective combined with understanding of business climate and adopted practice covering

1. Staff member of power plant during the construction - direct participation on construction and equipment installations, supervision of suppliers and designers, safety aspects of construction and operation.

2. Energy utility (10yrs) - Project preparation and project management activities, preparation and supervision of the plants technical development, site visits, supervision of suppliers installations., bidding procedures and construction preparation of new power plants, plant operations support, project management, supervision individual plants technical departments.

3. Consultancy activities in energy sector (11yrs) - feasibility studies, site visits, supervision of suppliers, supervision of installations, bidding procedures, supervision of reengineering and plant renovations, time scheduling, administrative and legal procedures during projects preparations

4. Export/import of complete power plants, equipment and technology (5yrs) Bidding procedures, preparation and realization supervision of power facilities, project management, planning, monitoring, and reporting.

He has experience of around 3 year in validation and verification of numerous CDM and JI projects. His qualification, industrial experience and experience in CDM demonstrate him sufficient sectorial competence in 1.1, 1.2."

A. Dallasta

Holds a Master Degree in Mechanical Engineering and has an overall experience of more than 25 years. Prior to joining DNV has experience on Cokemaking plants, Iron and steel making plants, glass and biomass plants.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectorial competence in Thermal energy generation from fossil fuels and biomass including thermal electricity from solar, Iron and steel, Glass manufacturing, Coke manufacturing.

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