VALIDATION REPORT

WASTE COKE OVEN GAS RECOVERY AND RECONSTRUCTION OF KILNS IN LOUDI WUJO INDUSTRIAL CO. LTD. IN CHINA

REPORT NO. 2012-9382

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VALIDATION REPORT

Date of first issue: 7 January 2011	ConCert Project No.: PRJC-221021-2010-CCS-AUS
Approved by: Edwin Aalders	Organisational unit: DNV KEMA Energy & Sustainability Accredited Climate Change Services
Client: COzero	Client ref.: Nicholas Armstrong

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Summary:

Project Name: Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd.

Country: China

Methodology: AMS-III.Q **Version:** 4.0

GHG reducing Measure/Technology: **U**utilization of waste gas and/or waste heat at existing facilities as an energy source for generation of heat; Technical Area 4.11 (Glass)

ER estimate: 57 461 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 "Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd." in China, as described in the PDD, version 5 of 20 March 2012 meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology AMS-III.Q, version 4.0. Hence, DNV requests the registration of the project as a CDM project activity.

Report No.: 2012-9382	Subject Group: Environment
Report title: Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd.	
Work carried out by: Noim Uddin, Zhang Lei Lucas, Zhang Xiaojun Johnsen, Grant Stephen Little, Chandrashekara Kumaraswamy, Jan Van Evercooren, Stanislav Dvořák	
Work verified by: Edwin Aalders	

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Indexing terms

Key words
Climate Change
Kyoto Protocol
Validation
Clean Development Mechanism

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Abbreviations

BE	Baseline Emissions
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CL	Clarification request
CM	Combined Margin
CO	Carbon Monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNA	Designated National Authority
DNV	Det Norske Veritas
DOE	Designated Operational Entity
EF	Emission Factor
EIA	Environmental Impact Assessment
ER	Emission Reductions
FAR	Forward Action Request
FSR	Feasibility Study Report
GHG	Greenhouse gas(es)
GSP	Global Stakeholder consultation Period
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
LoA	Letter of approval
MP	Monitoring Plan
MW	Mega Watt
NCV	Net Caloric Value
NDRC	National Development and Reform Commission
NGO	Non-governmental Organisation
Nm^3	Normal temperature and pressure m^3
ODA	Official Development Assistance
PDD	Project Design Document
PE	Project Emissions
tCO_2e	Tonnes of CO_2 equivalents
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value-added tax

1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed a validation of the project activity "Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd." in China. 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 China and Annex I Party is United Kingdom of Great Britain and Northern Ireland. Both Parties fulfil the participation criteria and have approved the project and authorized the project participant Loudi WUJO Industrial Co. Ltd and Originate Carbon Ltd. The DNA from China confirmed that the project assists in achieving sustainable development.

The project correctly applies the baseline and monitoring methodology AMS-IIIQ, version 4.0 "Waste energy recovery (gas/heat/pressure) Project".

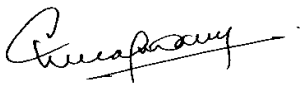
Project activity includes construction of a 27 km long gas pipelines and reconstruct existing kilns (including glass furnaces, lehres, processing lines), in order to recover coke oven gas as fuel and will replace coal gas as fuel and will thus reduce emission of GHGs. As a result, the project results in reductions of CO_2 emission that is real, measurable and gives 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 57 461 tCO_2e per year over the selected 10 year fixed crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring plan provides for the monitoring of the project's emission reductions. 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 "Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd." in China, as described in the PDD, version 5 dated 20 March 2012 meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology AMS-III.Q, version 4.0. Hence, DNV requests the registration of the project as a CDM project activity.

Bangalore and Oslo, 5 September 2012



Chandrashekara Kumaraswamy
CDM Validator
DNV Bangalore, India

Edwin Aalders
Approver,
DNV Climate Change Services AS

2. INTRODUCTION

COzero has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the "Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd." in China (hereafter called "the 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 and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD) /1/. 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 AMS-III.Q, version 4.0 /40/. The validation was based on the recommendations in the Validation and Verification Manual /39/.

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

3 METHODOLOGY

The validation consisted of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

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

The following sections outline each step in more detail.

3.1 Desk review of the project design documentation

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

3.1.1 Documentation provided by the project participants

/1/ B-road (International) Investment Management Co. Ltd.: CDM-PDD for project activity "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd." in China, version 3.0 dated 8 October 2010.

Received 120208_Wujo PDD
Received 120208_WUJO PDD_rev1
Received 120217_WUJO PDD_ver4
Received 120330_Wujo PDD_ver5
Received120410_Wujo PDD-ver5_Clean_TM response
Received 120717_Wujo PDD-ver5_clean_TM response
Received 120718_Wujo PDD-ver5_clean_TM response
Received 120803_Wujo PDD_ver5
Received 120806_Wujo PDD_ver5 (TR basis)
Received 120822_Wujo PDD_ver5
Received 120824_Wujo PDD_ver5
Received 120827_Wujo PDD_ver5

Received 120912_Wujo PDD_ver5 (Final Version, Request for Registration)
Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd., in China, version 5, dated 20 March 2012

/2/ Central Mechanical International Engineering Design Institute: The feasibility study report of "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd." February 2008.

/3/ Central Mechanical International Engineering Design Institute: Clarification of heat supply equation regarding the "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co., Ltd.", 17 June 2008
(This is extension of FSR with regard to measuring of thermal energy output from COG)

/4/ Hunan Province Economic Committee: The approval of FSR for "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd." dated 7 May 2008.

/5/ Loudi Environmental Protection Pesearch Institute: The Environmental Impact Assessment report (EIA) of "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd." in 4 May 2008.

/6/ Hunan environmental protection bureau: the approval of the EIA of "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd." on 5 May 2008.

/7/ B-road (International) Investment Management Co. Ltd: IRR calculation for project activity "Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd." in China, dated 21 October 2010.
120416_WUJO IRR.xls
120803_WUJO IRR.xls
120827_WUJO IRR.xls
120912_WUJO IRR.xls (Request for Registration version)

/8/ B-road (International) Investment Management Co. Ltd.: Emission reduction calculation for project activity "Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd." In China, dated 21 October 2010.
120416_WUJO ER sheet.xlsx
120803_WUJO ER sheet.xlsx
120912_WUJO ER.xlsx (Request for Registration version)

/9/ COzero and Loudi WUJO Industrial Co., Ltd.: CER Purchase Agreement, dated October 2009.

/10/ Lianyuan City Huiyuan Gas Co. Ltd and Loudi WUJO Industrial Co. Ltd, Kiln construction contract, 3 November 2008.

/11/ Lianyuan City Huiyuan Coal Gas Ltd. and Loudi WUJO Industrial Co. Ltd.: Gas agreement, dated 8 December 2008.

/12/ Loudi WUJO Industrial Co. Ltd and B-road (International) Investment Management Co. Ltd.: CDM Cooperation Contract, dated 16 October 2008.

/13/ Loudi WUJO Industrial Co. Ltd: Construction permission for Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd., dated 18 November 2008.

/14/ Loudi WUJO Industrial Co. Ltd: Board meeting decision for CDM consideration, dated 18 April 2008.

/15/ Loudi WUJO Industrial Co. Ltd: 50 copies of consultation questionnaires for the stakeholder comments in January 2009.

/16/ Loudi City Quality and technical inspection bureau, Hunan province, Lifetime proof for main equipment, 1 November 2009.

/17/ Lianyuan Huiyuan Coking Co., Ltd., COG discharging explanation, 5 February 2008.

/18/ Lianyuan City Huiyuan Gas Co. Ltd., Coke oven gas supply agreement, 8 December 2008

/19/ Loudi WUJO Industrial Co. Ltd, COG usage record for July-December 2010 and 2011, 30 March 2012.

/20/ Loudi WUJO Industrial Co., Ltd., The main equipment technical specifications, 1 March 2009

/21/ Loudi WUJO Industrial Co. Ltd, Coal and coal gas consumption records (from 2005 to

2007), 31 December 2007.

/22/ Lianyuan City Huiyuan Gas Co. Ltd. (COG supplier) and Changsha Laodaohe Construction Company, Pipe construction contract, 1 December 2008.

/23/ Loudi WUJO Industrial Co. Ltd, CDM project 'Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd., CDM notification form to NDRC and NDRC's Approval, 17 April 2009

/24/ Lengshuijiang Steel & Iron Co. Ltd, Fuel Switch from Coal to Coke Oven Gas in Wuijiang Industrial Co. Ltd, CDM notification to UNFCCC, dated 16 November 2009 (name of PP and Project name has been corrected as per CAR 2)

/25/ National Development and Reform Commission of the P. R. China, Economic Evaluation Methods and Parameters of Construction Project – benchmark IRR (version 3) 3 July 2006

/26/ COG Invoice (No. 01450825) dated 30 July 2010, and COG Invoice (No. 01450838) dated 2 September 2010, issued by Lianyuan City Huiyuan Gas Co. Ltd

/27/ Kiln and Retrofitting Invoice: retrofitting construction fee
Gathering Receipt No. 3028891 dated 15 December 2009 by Lianyuan City Huiyuan Gas Co. Ltd

/28/ 'Pipeline Construction Invoices':
Invoice No. 5035140 dated 15 December 2009 for payment of 7 million RMB issued by Hunan Laodaohe Construction Group
Invoice No. 5035123 dated 3 October 2010 for payment of 12 million RMB issued by Hunan Laodaohe Construction Group

/29/ Lianyuan City Meijiang Town Fixing Coal Mine, Coal Invoices No. 00927017, 00922785, 00922786, 00901392, 00901393, 00927018

/30/ China Machinery International Engineering Design and Research Institute, Coal gas price calculation evidence, May 2009

/31/ Hunan Provincial Government Pricing Bureau, Loudi water price evidence, 5 April 2002

/32/ China International Engineering Design and Research Institute, Kiln temperature evidence, May 2010

/33/ Changsa City Energy Utilization Monitoring Station, Kiln test report, 6 December 2010

/34/ Loudi City Construction Inspection Co. Ltd, Project Commissioning Testing Report of the project 'Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd., 1 April 2010

/35/ Loudi City Government Human Resource and Social Security Bureau, the average salary in Hunan Province in 2010' 1 June 2011

/36/ Coal gas equipment maintenance and repair service fee (including spare parts replacement), 5 January 2009, Lianyuan Huiyuan Gas Co. Ltd.

3.1.2 Letters of approval

/37/ DNA of China: National Development and Reform Commission: Letter of approval for "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd.", dated 21 May 2010.
It is confirmed by:

http://cdm.ccchina.gov.cn/website/CDM/pdf/Item_new/Item_new5363.pdf

/38/ DNA of the United Kingdom of Great Britain and Northern Ireland: Department of Energy & Climate Change: Letter of approval for "Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd.", dated on 16 September 2010.

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

/39/ CDM Executive Board: *Validation and Verification Manual*, Version 01.2, EB 55 Annex 1, dated 30 July 2010.

/40/ CDM Executive Board: *Baseline and monitoring methodology AMS-III.Q*, Version: 03, EB 51, *Waste energy recovery (gas/heat/pressure) Project*, dated 04 December 2009.
CDM Executive Board: *Baseline and monitoring methodology AMS-III.Q* version: 4.0, EB 60, Waste energy recovery (gas/heat/pressure) projects, dated 15 April, 2011

/41/ CDM Executive Board: *Attachment A of Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities*, Version 08.0, dated 29 September 2011, EB 63, Annex 24

/42/ CDM Executive Board: Guidance for request for deviation titled "*Application of AM0005 and AMS-I.D in China*", dated 7 October 2005.
http://cdm.unfccc.int/Projects/deviations/87512

/43/ CDM Executive Board: *Tool to determine the remaining lifetime of equipment*, detailed in EB 50, Annex 15 dated 16 October 2009

/44/ CDM Executive Board: *Glossary of CDM Terms* Version 06.0, EB 66, Annex 63, dated 2 March 2012

/45/ CDM Executive Board, Approved consolidated baseline and monitoring methodology ACM00012 version 04.0.0 EB 60, *Consolidated baseline methodology for GHG emission reductions from waste energy recovery project*, dated 15 April 2011

/46/ CDM Executive Board, Annex 46 *Guidance on the demonstration and assessment of prior consideration of the CDM* Executive Board Meeting Report, version 01, EB 41, 2 August 2008

/47/ CDM Executive Board, Annex 61 *Guidelines on the demonstration and assessment of prior consideration of the CDM*, Executive Board Meeting Report, version 02, EB 48, 17 July 2009

/48/ CDM Executive Board, Annex 13 *Guidelines on the demonstration and assessment of prior consideration of the CDM*, Executive Board Meeting Report, version 04, EB 62, 15 July 2011

/49/ CDM Executive Board: *Guidelines on the assessment of investment analysis*, version 05, Annex 5, EB 62

/50/ CDM Executive Board: *Consolidated baseline methodology for GHG emission reductions from waste energy recovery project*, version 04.0.0, Annex 5, EB 60, 15 April 2011

/51/ CDM Executive Board: Meeting Report EB 41 (Paragraph 67)

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

/52/ IPCC*: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Reference Manual, 2006.*

/53/ NDRC and the Ministry of Construction P. R. China: *the Economic Assessment method and Parameters for Construction Project, the third edition,* dated July 2006.

/54/ The Central People's Government of the People's Republic of China Regulation of the People's Republic of China on surtax for education expenses dated on the 20 August 2005.

/55/ The Law of the People's Republic of China on Enterprise Income Tax, [2007] No.63, implemented on 16 March 2007.

/56/ The Central People's Government of the People's Republic of China *Regulations of the People's Republic of China on City Maintenance and Construction Tax*, 19 August 2005.

/57/ Interim Regulation of the People's Republic of China on Value Added Tax dated on the 10 November 2008.

/58/ UNFCCC Registered CDM Projects:
5224: Zhonglian 4.5MW Waste Heat Power Generation Project in Hebei Province
4208: Jiangxi Nanfang Cement Low Temperature Waste Heat Power Generation Project
3564: Sichuan LiwanBusen Cement Waste Heat Recovery for Power Generation Project
3832: Liaoning Chaoyang Waste Gas Recovery for Electricity Generation

/59/ National Bureau of Statistics of China: *Fixed investment prices have increased from 2005 to 2007.*
http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20060227_402307796.htm
http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20070228_402387821.htm
http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20080228_402464933.htm

/60/ National Bureau of Statistics of China: *O&M cost increased from 2005 to 2007.*
http://www.stats.gov.cn/tjgb/qttjgb/qgqttjgb/t20060609_402329458.htm
http://www.stats.gov.cn/tjgb/qttjgb/qgqttjgb/t20070518_402405314.htm
http://www.stats.gov.cn/tjgb/qttjgb/qgqttjgb/t20080521_402481634.htm

/61/ UNFCCC: PDD version 3 dated 8 October 2010 of the project activity was webhosted for global stakeholder consultation for the period from 20 October 2010 to 18 November 2010
http://cdm.unfccc.int/Projects/Validation/DB/RH10CCFHHW8Y2S5B1TY2183GEBHV4Z/view.html

/62/ Pipeline specification, Hunan Laodaohe Construction Group Co., Ltd., 20 August 2012

The validation identified two CARs and ten CLs. The CARs and CLs were satisfactorily addressed by the project participants by among others 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 5 dated 20 March 2012)

were made compared to the version of the PDD published for stakeholder comments (version 3 dated 8 October 2010):

- Changes related to the responses provided to the CAR and CLs identified in the DNV's draft validation report.
- Methodology was updated from version 03 to version 4.0 of AMS-III.Q (CAR 1).
- Change of crediting period start date to 1 October 2012.
- The name of project activity has been corrected in revised PDD. The project name is in consistent with LoA from Host Party and LoA from Annex I Party, and the revised PDD (CAR 2).

After reviewing the revised version of the PDD version 5, dated 20 March 2012, DNV issued this final validation report and opinion.

3.2 Follow-up interviews with project stakeholders

On 28 December 2010 the GHG auditor Zhang Lei Lucas and CDM validator Zhang Xiaojun Johnsen from DNV visited the project site located at Loudi City, Hunan Province, P.R of China and performed interviews with project stakeholders.

	Date	Name	Organization	Topic
/63/	2010-12-28	Peng Canhua Jiang Wensheng Xie Xianzhi Zhang Tieru Peng Shimin	Loudi WUJO Industrial Co. Ltd (Project Owner)	➢ Information of project construction ➢ The development of similar projects in Hunan Province ➢ The approval status (incl. EIA approval, the feasibility study report approval, CDM project approval) ➢ Project management ➢ Emission reduction monitoring plan ➢ Consulting process for stakeholder's comments ➢ Investment risks and barriers
/64/	2010-12-28	Wu Ehui Deng Kuihuan Liu Zhiyong	B-road (International) Investment Management Co Ltd PProject Consultant)	➢ Baseline determination of the project ➢ Applicability of selected methodology AMS-IIIQ ➢ Issues related to the additionality ➢ Common practice analysis ➢ Emission reductions calculation ➢ Emission reduction monitoring plan and project management

3.3 Resolution of outstanding issues

The objective of this phase of the validation is to resolve any outstanding issues which need be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a

transparent manner the criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

It organises, details and clarifies the requirements a CDM project is expected to meet;

It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of four tables. The different columns in these tables are described in the figure below. The completed validation protocol for the project activity "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd." in China 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 CDM requirements have not been met;

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

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

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

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

Validation Protocol Table 2: Requirement Checklist				
Checklist question	***Reference***	***Means of verification (MoV)***	***Assessment by DNV***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the CDM-PDD	*Gives reference to documents where the answer to the checklist question or item is found.*	*Means of verification (MoV) are **document review (DR)**, **interview (I)** or any other follow-up actions (e.g., on site visit and telephone or email interviews) and **cross-checking (CC)** with available information relating to projects or technologies similar to the proposed CDM project activity under validation.*	*The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.*	*OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A **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 4.11 (Glass)	TA 4 Other (coke)	Financial expertise
Team leader (Validator) (from 2012)	Kumaraswamy	Chandrashekara	India	✓		✓	✓				
Validator	Lucas	Zhang Lei	China	✓	✓	✓				✓	
Validator (until 2011)	Johnsen	Xiaojun Zhang	China	✓	✓				✓		✓
Expert	Little	Grant Stephen	South Africa	✓							✓
Assessor under training	Uddin	Noim	Australia	✓		✓					
Expert (SE input at TR)	Dvořák	Stanislav	Czech Republic						✓		
Expert (SE input at TR)	Van Evercooren	Jan	Belgium							✓	
Technical reviewer	Aalders	Edwin	Norway					✓			

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 initial validation findings relate to the project design as documented and described in the PDD, version 5 dated 20 March 2012 /1/.

4.1 Participation requirements

The project participants are Loudi WUJO Industrial Co. Ltd. of China and the Originate Carbon Ltd of the United Kingdom of Great Britain and Northern Ireland. The host Party (China) meets all relevant participation requirements. China fulfils the requirements for participating in a CDM project activity. China ratified the Kyoto Protocol on 30 August 2002 and has established DNA, National Development and Reform Commission (NDRC).

A letter of approval (LoA) /37/ was issued by DNA of China on 21 May 2010, authorizing Loudi WUJO Industrial Co. Ltd as project participant and confirming that the project assists in achieving sustainable development /37/. By checking the link from NDRC, DNA of China, DNV can verify the authenticity of LoA from China:

http://cdm.ccchina.gov.cn/website/CDM/pdf/Item_new/Item_new5363.pdf

The LoA from Annex I Party the United Kingdom of Great Britain and Northern Ireland issued on 16 September 2010 /38/ has been received from B-road (International) Investment Management Co. Ltd. authorizing Originate Carbon Ltd. as project participant and confirming the voluntary participation in the CDM. DNV does not doubt the authenticity of the letter of approval.

DNV considers the letters are in accordance with paragraphs 45-48 of the VVM version 1.2 /39/.

The validation did not reveal any information that indicates the project can be seen as a diversion of official development assistance (ODA) funding towards China.

4.2 Project design

The proposed project waste coke oven gas (COG) recovery via reconstruction of existing kilns at WUJO (Loudi WUJO Industrial Co. Ltd) is located in Shimen Industry Park, Maotang Town, Lianyuan, Hunan Province, the People's Republic of China. The central geographical coordinates of the project is at longitude of 111.7458^0East and latitude of 27.7631^0North.

Prior to the implementation of the proposed project, 2 sets of glass furnaces, 4 sets of Lehres, 2 sets of processing lines, 1 boiler and 5 enamel converters were operating at the Loudi WUJO Industrial Co. Ltd. Prior to the project implementation, these facilities used coal gas as the fuel to generate thermal energy through 3 water coal gas furnaces and 3 mixed coal gas furnaces. Water Coal Gas is the mixture of carbon monoxide and hydrogen, generated by heating coal and water vapour. Mixed Coal Gas – created using air and water as a gasifying agent, and reacting with the heating coal to generating gas. Collectively these are referred to as 'coal gas' in the PDD /1/.

In the project scenario, 3 water coal gas furnaces and 3 mixed coal gas furnaces will be removed and the coal gas will be replaced by coke oven gas supplied by the two sets of coke

ovens at the nearby Lianyuan City HUIYUAN Gas Co., Ltd (which is a branch of Hunan Wujo Light Industry & Chemicals Group Co. Ltd).

Lianyuan City HUIYUAN Gas Co., Ltd, a branch of Hunan Wujo Light Industry & Chemicals Group Co. Ltd releases about 3.5×10^8 Nm^3 of Coke Oven Gas (COG), as byproduct of coke production, into the atmosphere after incineration. The proposed project activity involves reconstruction of existing kilns (including glass furnaces, lehres, processing lines, boilers and enamel converters) and installation of a set of gas pipelines with a length of 27 km from Huiyuan to WUJO /2/, to recover the Coke Oven Gas (COG) and use them as fuel instead of the current coal gas for generation of heat.

Following Table 1 and Table 2 provides details of equipment specification before and after the project implementation, respectively. Specifications of the main equipment have been verified from approved FSR /2/ and 'the main equipment technical specifications' /20/. The remaining lifetime of the main equipment have been verified from 'Main equipment lifetime proof' issued by Hunan Province Loudi City Quality & Technical Inspection Bureau /16/.

Table 1: Main equipment specification before the implementation of the project activity:

Name of equipment	Quantity	Main technical parameters	
63-hole WKD43D coke oven	2	Designed annual yield of coke:	400,000 tonnes
		COG yield per unit of coke:	437.5 Nm^3/t
		Designed annual yield of COG:	175,000,000 Nm^3
		Total annual yield of COG of 2 coke ovens:	350,000,000 Nm^3
		Technical Lifetime:	20 year
		Remaining lifetime:	14year
Water coal gas furnace	3	Designed annual yield of water coal gas:	2800-3200 Nm^3/h
		Furnace diameter:	2400mm
		Ash pan revolution speed:	0-2r/h
		Technical Lifetime	20 year
		Year Installed	2005
		Remaining Lifetime	13 year
Mixed coal gas furnace	3	Model:	GC-3
		Designed annual yield of mixed coal gas:	5000-6000 Nm^3/h
		Furnace diameter:	3000 mm

		Ash pan revolution speed:	0.232-2.571 r/h
		Technical Lifetime	20
		Year Installed	2005
		Remaining Lifetime	13 year
$45m^2$ glass furnace	1	Output of glass solution:	77—80t/d
		Area:	$45m^2$
		Furnace pressure:	20kPa
		Suitable motor parameters:	YZ160M-6 5KW
		Fuel type:	Coal gas
		Energy efficiency:	89%
		Lifetime:	15 yearr
$56m^2$ glass furnace	1	Output of glass solution:	75—78t/d
		Area:	56 m^2
		Fuel type:	Coal gas
		Suitable motor parameters:	YZ160M-6 5.5KW
		Furnace pressure:	20kPa
		Energy efficiency:	89%
		Lifetime:	15 yr
6 ton Coal Burnt Boiler	1	Model:	SHFx6-1.25-LIZ
		Output of steam:	6t/h
		Temperature:	194^0C
		Pressure:	1.25MPa
		Energy efficiency:	89%
		Technical Lifetime	25 year
		Year Installed	2000
		Remaining Lifetime:	13 year
Lehre	2	Width of net:	1800mm/2050mm

		Length of net:		37m
		Suitable motor parameters:		YCTL180-4A,4KW
		Energy efficiency:		88%
		Lifetime:		20 year
	2	Width of net:		2600mm
		Suitable motor parameters:		YCTL180-4A,5.5KW
		Energy efficiency:		88%
		Lifetime:		20 year
Processing line	2	Including:	1. Capping machine	PTZTF2L-3.2L-42 FK3.2-41 FK2-41
			2. Cut small opening machine Cut big opening machine Cut big bottom machine	
			3. Drying machine	C series
			4. End-pulling machine	WL-K-2
				2L
		Lifetime:		20 year
		Energy efficiency:		82%
Enamel converter	3	Diameter of switcher		Φ3600
		Length×width×height of heating zone/m		17×0.72×0.782
		The chain length of Firing furnace/m		40
		Temperature of heating zone		820-880 ^{0}C
		Production capacity (Kg/h)		2200-3000
		Lifetime:		20 yearr
		Energy efficiency:		82%
	1	Diameter of switcher		Φ2700
		Length×width×height of heating zone/m		17×0.62×0.782

		The chain length of Firing furnace/m	40
		Temperature of heating zone	820-880□
		Production capacity (Kg/h)	2500-2600
		Lifetime:	20 year
		Energy efficiency:	82%
	1	Length×width×height of heating zone /m	3×1.6×0.4
		Temperature of heating zone	820-880 ^{0}C
		Production capacity (Kg/h)	1250-1300
		Lifetime:	20 yearr
		Energy efficiency:	82%

Table 2: Main equipment specification after the implementation of the project activity:

Name of equipment	**Quantity**	**Main technical parameters**	
COG compressor	1	Model:	L93WD/L84WD
		Outlet pressure/ temperature:	30Kpa/40^{O}C
		Voltage:	10kV/380V
		Medium:	COG
		Flow rate:	315m^3/min
		Technical Lifetime:	15 years
		Year Installed:	2009
		Remaining Lifetime:	12 years
45m^2 glass furnace	1	Output of glass solution:	77-80t/d
		Area:	45m^2
		Fuel type:	COG
		Suitable motor parameters:	YZ160M-6 5KW
		Furnace pressure:	20kPa
		Energy efficiency:	93%
		Technical Lifetime:	25 years

		Year Installed:	2000
		Remaining Lifetime:	13 years
56m^2 glass furnace	1	Output of glass solution:	75-78t/d
		Area:	56 m^2
		Fuel type:	COG
		Suitable motor parameters:	YZ160M-6 5.5KW
		Furnace pressure:	20kPa
		Energy efficiency:	93%
		Technical Lifetime:	25 Years
		Year Installed:	2001
		Remaining Lifetime:	14 years
6 tonne COG burnt boiler	1	Model:	SZL6-1.25-WIIAI
		Yield of steam:	6t/h
		Temperature:	194 ^{0}C
		Pressure:	1.25Mpa
		Energy efficiency:	92%
		Technical Lifetime:	20
		Year Installed:	2009
		Remaining Lifetime:	17 years
Lehre	2	Width of net:	1800mm/2050mm
		Length of net:	37m
		Suitable motor parameters:	YCTL180-4A, 4KW
		Fuel type:	Coke Oven Gas
		Energy efficiency:	94%
		Technical Lifetime:	24 years
		Year Installed:	2004
		Remaining Lifetime:	16 years
	2	Width of net:	2600mm
		Suitable motor parameters:	YCTL180-4A, 5.5KW

		Fuel type:		Coke Oven Gas
		Energy efficiency:		94%
		Technical Lifetime:		24 years
		Year Installed:		2004
		Remaining Lifetime:		16 years
Processing line	2	Including :	1. Capping machine	PTZTF2L-3.2L-42 FK3.2-41 FK2-41
			2. Cut small opening machine Cut big opening machine Cut big bottom machine	
			3. Drying machine	C series
			4. End-pulling machine	WL-K-2
				2L
		Fuel type:		COG
		Technical Lifetime:		20 years
		Year Installed:		2004
		Remaining Lifetime:		12 years
		Energy efficiency:		82%
20,000m^3 gas cabinet	1	Volume:		20,000 m^3
		Medium:		COG
		Technical Lifetime:		20 years
		Year Installed:		2009
		Remaining Lifetime:		17 years
Enamel converter	3	Diameter of switcher		Φ3600
		Length×width×height of heating zone /m		17×0.72×0.782
		The chain length of Firing furnace/m		40
		Temperature of heating zone		820-880 ^{0}C
		Production capacity (Kg/h)		2200-3000

		Fuel type:	COG
		Technical Lifetime:	20 years
		Year Installed:	2004
		Remaining Lifetime:	12 years
		Energy efficiency:	82%
	1	Diameter of switcher	Φ2700
		Length×width×height of heating zone /m	17×0.62×0.782
		The chain length of Firing furnace/m	40
		Temperature of heating zone	820-880 ^{0}C
		Production capacity (Kg/h)	2500-2600
		Fuel type:	COG
		Technical Lifetime:	20 years
		Year Installed:	2004
		Remaining Lifetime:	12 years
		Energy efficiency:	82%
	1	Length×width×height of heating zone (m^3)	3×1.6×0.4
		Temperature of heating zone	820-880 ^{0}C
		Production capacity (Kg/h)	1250-1300
		Fuel type:	COG
		Technical Lifetime:	20 years
		Year Installed:	2004
		Remaining Lifetime:	12 years
		Energy efficiency:	82%

The two sets of coke ovens in Lianyuan Huiyuan Coking Co. Ltd releases about 3.5X10^8 Nm^3 COG /17/ as by product of coke production /2/. The project will utilize 71,880,000 Nm^3/year of waste coke oven gas /18/ from coke production, which is one-fifth (20%) of total COG produced and transported via gas pipeline to generate heat in WUJO glass manufacturing facility so as to replace the coal gas.

The COG is burnt in two glass furnaces, in which raw materials are heated and melted into liquid for producing glass. The total COG usage amount from July to December in 2010 was

recorded as 52,134,205.5 Nm^3 and the total COG usage amount in 2011 was recorded as 74,956,478.0 Nm^3 /19/. This demonstrates that the COG consumption in project scenario is significantly less than the total amount of COG produced by Lianyuan Huiyuan Coking Co. Ltd /17/. This is significantly less than the total amount of COG produced by Lianyuan Huiyuan Coking Co. Ltd. Additionally there is a 20,000 Nm^3 COG gas cabinet /2/ that can store and adjust the supply of COG. In case of project downtime, consumption of grid electricity is not required and the COG gas in the gas cabinet is a timely energy supplement source.

The construction of the gas pipeline (specification of pipeline is L245*D426*10mm /62/) was completed at the time of site inspection by the DNV audit team /63/.

The project included three systems: coke ovens in Huiyuan, glass furnaces, Lehres, processing lines, boiler, enamel converters and other auxiliary facilities in WUJO.

The project starting date is defined as the date of the kiln reconstruction contract signed on 3 November 2008/10/, which is an early financial commitment by the PP. DNV considers the definition of the project starting date to be in line with "Glossary of CDM terms" (version 06.0) /44/ in which the defined starting date of the project activity is the earliest date at which either the implementation or construction or real action of the project activity begins.

The technical lifetime of project activity is 10 years /2/. Lifetime of the main equipment have been verified as per "Tool to determine the remaining lifetime of equipment", detailed in EB 50, Annex 15 (16 October 2009) /43/ from the evidence "Main equipment life time proof" issued by Hunan Province Loudi City Quality & Technical Inspection Bureau on 1 November 2009 as detailed in Table 1 and Table 2 above /16/. A fixed 10 years crediting period has been selected by the project participants starting 1 October 2012. The emission reductions are calculated to be on average 57 461 tCO_2e per year over the fixed ten-year crediting period.

During the site visit, DNV checked the completeness and consistency of the project description reported in the PDD and can confirm that the information and considerations reported are complete and accurate.

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

4.3 Application of selected baseline and monitoring methodology

The project correctly applies the approved consolidated baseline and monitoring methodology AMS-III.Q "Waste energy recovery (gas/heat/pressure) Project", version 4.0 /40/.

The GSP version of PDD /1/ adopted methodology AMS-III.Q (version 03) /40/. The revised version of PDD has adopted the updated methodology AMS-III.Q, version 4.0.

A CAR was raised in Table 3 (CAR 1) in order for PP to provide revised PDD with adopted new version of the methodology. Other issues were raised on the project's compliance with the applicability criteria of the applied methodology as follows:

- For determining the time periods for which the emission reduction credits can be claimed, the remaining lifetime of equipment currently being used is requested to be demonstrated and compared with the crediting period (CAR 1)
- The waste coke oven gas utilization status in the absence of the project activity needs to be proven by one of the designated options provided in the applied methodology (CAR 1).

The assessment was carried out for each applicability criteria and included among others the compliance check of the local project setting with the applicability conditions in regard to baseline setting and eligible project measures.

Methodology applicability criteria	**Applicable or not relevant**	**Justification / Explanation of Proposed Project Activity**
The category is for project activities that utilize waste gas and/or waste heat at existing facilities as an energy source for: (a) Cogeneration; or (b) Generation of electricity; or (c) Direct use as process heat; or (d) Generation of heat in elemental process (e.g. steam, hot water, hot oil, hot air); or (e) Generation of mechanical energy	Applicable	The proposed project waste coke oven gas (COG) recovery via reconstruction of exiting kilns at WUJO (Loudi WUJO Industrial Co. Ltd) is located in Shimen Industry Park, Maotang Town, lianyuan, Hunan Province, China as an energy source for the generation of heat in elemental processes including: glass furnaces, Lehres, processing lines, boilers and enamel converters /2/.
The category is also applicable to project activities that use waste pressure to generate electricity at existing facilities.	Not relevant	The project activity does not involve the utilization of waste pressure.
The recovery of waste gas/heat/pressure should be a new initiative (no waste gas/heat/pressure was recovered from the project activity source prior to the implementation of the project activity).	Applicable	This is a new initiative as it relates to reconstruction of existing kilns at WUJO. Prior to the proposed activity, these facilities were using coal gas as fuel for thermal energy generation. From 3 sets of water coal gas furnace and 3 sets of mixed coal gas furnaces /2/. And as confirmed during the site visit.
Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually.	Applicable	The emission reduction is 57,461 t CO_2e/yr, which is less than 60 kt CO_2e/yr. This is consistent with the Methodology AMS-III.Q (version 4.0).
The category is applicable under the following conditions: a) The energy produced with the recovered waste gas/heat or waste pressure should be measurable; b) Energy generated in the project activity may be used within the industrial facility or exported to other industrial facilities (included in the project boundary);	Applicable	a) The energy produced with the recovered waste COG will be measured by measuring waste coke oven gas via flow meter installed in the main pipeline and compressed coke oven gas as used gas consumed equipments via flow meter installed at the gas inlet of each equipment. This is in accordance of the monitoring plan as stated in the PDD /1/.

c) Electricity generated in the project activity may be exported to the grid or used for captive purposes. However, the methodology is not applicable to projects where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g., gas turbine or diesel generator) where heat generated on site is not utilizable for any other purposes on-site except to generate power. The projects recovering waste energy from such power plants for the purpose of generation of heat only can apply this methodology; d) For a project activity which recovers waste gas/heat/pressure for power generation from multiple sources (e.g. kiln and single-cycle power plant), this methodology can be used in combination with AMS-III.AL provided that: (i) Within the project activity it is possible to distinguish two distinct waste energy sources such that: • Waste energy source-I (e.g. kiln) belongs to such waste heat sources which are eligible under AMS-III.Q; • Waste energy source-II (e.g. single-cycle power unit) belongs to such waste heat sources which are eligible under AMS-III.AL; (ii) It is possible, for each waste energy source, to determine the baseline according to the specific methodology referred to; (iii) It is possible to objectively allocate the electricity produced in the project activity to each waste energy source, by means of one of the following methods: • Through separate measurements of the electricity produced by utilizing waste energy from each waste energy source; or • Through separate measurements of the energy content of the waste energy carrying medium (WECM)		b) The proposed project will use the energy generated (heat) by utilization of waste COG in the kilns only and within the project boundary. The project boundary includes coke ovens in Huiyuan and glass furnaces, Lehres, processing lines, boiler, enamel converter and other auxiliary facilities in WUJO and a set of gas pipes with a length of 27 km from Huiyuan to WUJO, which is consistent with the Methodology AMS-III.Q (version 4). c) This project does not involve in any electricity generation. The proposed project recovers waste COG for the purpose of generation heat in the kilns. d) This project activity does not involve for power generation. e) The emission reductions are claimed by Loudi WUJO Industrial Co., Ltd., the generator of thermal energy using waste energy (COG). Loudi WUJO Industrial Co. Ltd, which is the PP from Host Party /1//37/. f) All of the energy generated by waste COG in the project is used by the project owner itself. There is no energy exported to other facilities. PP Loudi WUJO Industrial Co. Ltd owns coke ovens in HUIYUAN and glass furnaces, Lehres, processing lines, boiler, enamel converter and other auxiliary facilities in WUJO. g) The credits will be claimed in a fixed crediting period of 10 years. The remaining lifetime of all equipment currently being used is more than 10 years. Technical lifetime and the remaining lifetime of all the equipment has been demonstrated in '*Lifetime proof for main equipment*' by Hunan Province Loudi City Quality &

streams used for electricity production; or • Through separate measurements of the energy content of the waste energy streams that are associated with each waste energy source and used for electricity production or for the WECM generation in a common waste heat recovery system (e.g. if steam is generated by waste heat from a kiln and waste heat from an internal combustion engine in a common waste heat recovery boiler); e) The emission reductions are claimed by the generator of energy using waste energy; f) In cases where the energy is exported to other facilities (included in the project boundary), the following are required; (i) All historical information from the recipient plants; (ii) An official agreement exists between the owners of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by the recipient plant(s) for using a zero-emission energy source; g) For those facilities and recipients included in the project boundary, that prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods: (i) The remaining lifetime of equipment currently being used; and (ii) Crediting period. h) The waste gas/heat or waste pressure utilized in the project activity would have been flared or released into the atmosphere in the absence of the		technical inspection Bureau on 1 Nov 2009 /16/. h) In the project, Option (iv) is selected to demonstrate the COG status in the absence of the project activity. Direct measurement of COG was not made prior to the project's implementation, and there is no evidence in the form of Energy bills as the waste gas was released to the atmosphere. Similarly, a historical energy balance is not available for the separate facility generating the waste gas used in the project. Therefore, manufacturer's original specification/ information, schemes and diagrams from the construction of the facility are used to estimate the quantity and energy content of waste gas/heat produced at the plant and to calculate the capacity/per unit of product produced. There are in total two coke ovens in the Huiyuan coking plant, the COG production capacity of each coke oven is 175,000,000 Nm^3, COG production capacity of the two coke ovens is 350,000,000 Nm^3 /17/. In absence of the project (baseline), the COG was released into the atmosphere after incineration. At the time of site visit it was observed that the gas was being vented /63//64/. Further it is confirmed from 'the main equipment technical specifications' issued by Loudi WUJO Industrial Co. Ltd that the COG is released into the atmosphere after incineration /20/.

project activity. This shall be proven by one of the following options: (i) Direct measurements, (ii) Energy balance, (iii) Energy bills, (iv) Process plant manufacturer's original specifications		
For the purpose of this category waste energy is defined as: a by-product gas/heat/pressure from machines and industrial processes having potential to provide usable energy, for which it can be demonstrated that it was wasted. For example gas flared or released into the atmosphere, the heat or pressure not recovered (therefore wasted). Gases that have intrinsic value in a spot market as energy carrier or chemical (e.g., natural gas, hydrogen, liquefied petroleum gas, or their substitutes) are not eligible under this category.	Not applicable	The project activity involves recovery of coke oven gas only to use as heat. Prior to the implementation of the project activity COG was released to the atmosphere following incineration.

The selected baseline methodology is applicable as the following applicability conditions are fulfilled. The assessment of the project's compliance with the applicability criteria of AMS-III.Q (version 4.0) are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

4.4 Project Boundary

The project boundary was assessed in the context of physical site inspection, interviews and based on the secondary evidence received on the design of the project. As per PDD /1/, the geographical extent project boundary and the corresponding of proposed project boundary are demonstrated.

- *The industrial facility where waste energy is generated, including the part of the industrial facility where the waste heat was utilized for generation of captive electricity prior to implementation of the project activity:*

Validation by DNV: coke ovens in Lianyuan HUIYUAN Coking Co. Ltd as per PDD /1/, approved FSR /2/ and site visit inspection /63//64/.

- *The facility where process heat in the element process/steam/electricity/mechanical energy is generated (generator of process heat/steam/electricity/mechanical energy). Equipment providing auxiliary heat to the waste energy recovery process shall be included within the project boundary:*

Validation by DNV: glass furnaces, Lehres, processing lines, boiler, enamel converter and other auxiliary facilities in WUJO and a set of gas pipes with a length of 27 km from HUIYUAN to WUJO as per PDD /1/, approved FSR /2/ and site visit inspection /63//64/.

- *The facility (ies) where the process heat in the element process/steam/electricity/ mechanical energy is used (the recipient plant(s)) and/or grid where electricity is exported, if applicable:*

Validation by DNV: glass furnaces, Lehres, processing lines, boiler, enamel converter and other auxiliary facilities in WUJO as per PDD /1/, approved FSR /2/ and site visit inspection /63//64/.

It is in DNV's opinion that the geographical extent of project boundary of Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd. is clearly defined.

The emission source in this project boundary is as following table:

	Source	Gas	Included/excluded?	Justification / Explanation
Baseline	Fossil fuel consumption for thermal energy generation	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Baseline emissions from the flaring process, if any	CO_2	Excluded	Because there is no historic data, excluded for simplification. This is conservative
		CH_4	Excluded	
		N_2O	Excluded	
Project Activity	Supplemental fossil fuel consumption at the project plant	CO_2	Excluded	There is no fossil fuel consumption at the project plant
		CH_4	Excluded	
		N_2O	Excluded	
	Supplemental electricity consumption.	CO_2	Excluded	The project does not need supplemental electricity.
		CH_4	Excluded	
		N_2O	Excluded	
	Project emissions from cleaning of gas	CO_2	Excluded	The project does not include such process.
		CH_4	Excluded	
		N_2O	Excluded	
	project emissions due to the combustion of the waste COG	CO_2	Excluded	Excluded. Because in absence of the project, the COG is released into the atmosphere after incineration.
		CH_4	Excluded	
		N_2O	Excluded	

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 is expected to contribute more than 1% of the overall expected average annual emission reduction, which are not addressed by AMS-III.Q (version 4.0) /40/.

4.5 Baseline determination

According to paragraph 105 of the VVM version 1.2 /39/, if the approved methodology selected by the proposed project prescribes the baseline, no further analysis for identifying alternative scenarios is required. Thus, the identification of alternatives to the project activity has not been considered for the proposed project. The additionality has been assessed and has been described in Section 4.6 of this report.

In accordance with adopted methodology AMS-III.Q, version 4.0 /40/, the baseline of the project activity has been demonstrated by considering the following situation:

In the situation where the electricity is obtained from a specific existing power plant or from the grid, mechanical energy is obtained by electric motors and heat from a fossil fuel based element process (e.g. steam boiler, hot water generator, hot air generator, hot oil generator), baseline emissions can be calculated as follows:

(a) Baseline emissions from electricity ($BE_{elec,y}$) generated by waste energy

(b) Baseline emissions from electricity ($BE_{Elec,y}$) to provide mechanical energy generated by waste energy

(c) Baseline emissions to provide thermal energy generated by waste energy ($BE_{Ther,y}$)

Baseline scenario:

Prior to the implementation of the proposed project, 2 sets of glass furnaces, 4 sets of Lehres, 2 sets of processing lines, 1 boiler and 5 enamel converters were operating at the Loudi WUJO Industrial Co. Ltd. Prior to the project implementation, these facilities used coal gas as the fuel to generate thermal energy through 3 water coal gas furnaces and 3 mixed coal gas furnaces. Water Coal Gas is the mixture of carbon monoxide and hydrogen, generated by heating coal and water vapour. Mixed Coal Gas – created using air and water as a gasifying agent, and reacting with the heating coal to generating gas. Collectively these are referred to as 'coal gas' in the PDD /1/.

The proposed project activity involves recovery of coke oven gas from Lianyuan City Huiyuan Coking Co. Ltd and transport the COG via 27 km pipeline from HUIYUAN to WUJO. In absence of the proposed project activity, the COG is released into atmosphere after incineration. Kilns at WUJO uses coal gas fuel to generate thermal energy.

No electricity and no mechanical energy will be generated and no cogeneration exists in the project activity. Hence, option (a) and (b) are not possible baseline scenarios. Hence option (c) – baseline emissions to provide thermal energy generated by waste energy is selected as the baseline scenario.

In the baseline scenario, a total of 3.5×10^8 Nm^3 COG produced by two coke ovens /17/ was released to atmosphere after incineration has been verified from 'The main equipment technical specifications' issued by Loudi WUJO Industrial Co. Ltd /20/. Before implementation of the project, amount of coal gas consumed by the existing kilns accounted 122,142,559 Nm^3 in 2005, 121,266,614 Nm^3 and 120,326,700 Nm^3 in 2007, which is verified from FSR /2/ and 'Coal and coal gas consumption records (from 2005 to 2007) /21/.

Table 1 above provides details of the main equipment specification before the implementation of the project activity.

Project scenario:

In the project scenario, 3 water coal gas furnaces and 3 mixed coal gas furnaces will be removed and the coal gas will be replaced by coke oven gas supplied by the two sets of coke ovens at the Lianyuan City HUIYUAN Gas Co., Ltd (which is a branch of Hunan Wujo Light Industry & Chemicals Group Co. Ltd).

The existing kilns and furnaces at WUJO will be reconstructed and a set of gas pipelines with a length of 27 km from Huiyuan to WUJO will be implemented in order to switch from coal gas to COG utilization.

Table 2 above provides details of the main equipment specification before the implementation of the project activity.

The baseline of the project activity has been demonstrated in accordance with adopted methodology ASM-III.Q version 4.0 /40/ and has been correctly applied to identify baseline scenario 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 documentations relevant for establishing the baseline scenario and are correctly quoted and interpreted in the PDD. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable.

4.6 Additionality

The project's additionality has been demonstrated in accordance with Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities /41/. This approach is in accordance with adopted methodology AMS-III.Q version 4.0 /40/. Project participants have adopted investment barrier in order to demonstrate additionality of the project activity.

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

Project start date:

According to the definitions of starting date shown in Paragraph 67 EB 41 /51/, the starting date shall be considered as the date at which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. DNV has verified that 3 November 2008 is the project start date. This has been verified from the Kiln construction contract agreement between Lianyuan City Huiyuan Gas Co. Ltd and Loudi WUJO Industrial Co. Ltd /10/. This represents the earliest financial commitment for the project activity as all purchasing contracts relative to the project equipment have been signed after this date. Further, DNV has verified that the date of pipe construction contract, which was signed on 1 December 2008 between Lianyuan City Huiyuan Gas Co. Ltd. (COG supplier) and Changsha Laodaohe Construction Company /22/. Hence, the earliest commitment to financial expenditure is 3 November 2008 /10/.

Serious consideration of CDM and efforts to secure CDM status:

CDM project activity shall comply with the requirements of the latest version of the guidance on prior consideration as per CDM EB 62 /48/.

CDM notification to NDRC, the CDM DNA of China was submitted on 17 April 2009 and acknowledged by NDRC on 27 April 2009 /23/.

CDM notification to CDM EB was submitted on 30 November 2009 (project name Fuel Switch from Coal to Coke Oven Gas in Wuijiang Industrial Co. Ltd Lianyuan by Lengshuijiang Steel & Iron Co. Ltd) /24/. CAR 2 was raised in order to clarify the variation in the name of PP and project title as appeared in communication to UNFCCC when compared with PP name and project title in PDD as appeared for Global Stakeholder Consultation on 20 October 2010 /61/.
http://cdm.unfccc.int/Projects/Validation/DB/RH10CCFHHW8Y2S5B1TY2183GEBHV4Z/view.html

In response to CAR 2, PP has justified that the requirement for notifying prior consideration to UNFCCC as per Annex 46, EB 41, 2 August 2008 /46/ is applicable (prior consideration notification to either Host Party CDM DNA and/or UNFCCC) for this project activity not Annex 61, EB 48, 17 July 2009 /47/ (prior consideration notification to both Host Party CDM DNA and UNFCCC). It is in DNV's opinion that prior notification to NDRC, the CDM DNA of China is appropriate and has reasonably addressed by PP.

It has also been demonstrated that CDM has been seriously considered for the project activity from the following sequence of events:

- Feasibility Study Report 'Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd., by Central Mechanical International Engineering design Institute, February 2008 /2/.
- Board of Directors decision to develop the project into CDM, 18 April 2008 /14/.
- Completed FSR and received the approval of Hunan committee of Economic, 7 May 2008 /4/.
- Environmental Impact Assessment Report, Loudi environmental protection research institute, 4 May 2008 /5/.
- Approval of Environmental Impact Assessment, Loudi environmental protection research institute, 5 May 2008 /6/.
- Construction contract issued by Lianyuan City Huiyuan Gas Co. Ltd, 3 November 2008 project start date) /10/.
- Singed a consulting contract with B-road Investment Co. Ltd to develop CDM project, 16 October 2008 /12/.
- Notification of CDM intent approval from NDRC, CDM DNA of China 17 April 2009 /23/.
- Signed ERPA with CERs purchaser, October 2009 /9/.
- Prior consideration to UNFCCC (with project name Fuel Switch from Coal to Coke Oven Gas in Wuijiang Industrial Co. Ltd Lianyuan by Lengshuijiang Steel & Iron Co. Ltd) 16 November 2009 (acknowledged by UNFCCC on 30 November 2009) /24/.
- Operation start date (1 April 2010) as the date of commissioning of the project activity /34/.
- Letter of Approval from NDRC, the CDM DNA of China May 2010 /37/.

- Letter of Approval from UK CDM DNA, 16 September 2010 /38/.
- Webhosted of PDD for global stakeholder consultation via UNFCCC web on 19 October 2010

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 Annex 13, EB 62 /48/.

4.6.2 Identification of alternatives to the project activity

No alternative scenario has been identified except the baseline scenario.

4.6.3 Investment analysis

Choice of approach

Since the proposed activity generates financial and economic benefits other than CDM-related income through saving due to not having to purchase coal and generate coal gas and the baseline alternative does not involve an investment for the project participants, a benchmark analysis is justified for conducting the investment analysis.

Benchmark selection

According to the 'Economic Evaluation Method and Parameter for Construction Project' version 3 /25/ issued by China NDRC, a project-IRR of 13% (before tax) is regarded as a benchmark for investing in glass manufacturing industry in China, which is the latest available at the time of decision The benchmark of 13% (project-basis before tax) is therefore appropriate to this project. DNV was able to confirm this is suitable and reasonable as following:

- The main products of the Loudi WUJO Industrial CO. Ltd, which is a branch of Hunan WUJO Light Industry & Chemicals Group Co. Ltd /2/, are vacuum flask and ceramic products.
- This benchmark was determined by NDRC of China /25/ and represents a government/official approved benchmark.
- This benchmark is for project and before tax and the IRR type of this project is also for project and before tax.

DNV is thus able to confirm that this benchmark is suitable and reasonable.

Input parameters

DNV has validated the input parameters used in financial analysis according to the Guidelines on the assessment of investment analysis /49/ and in accordance to the VVM version 1.2 /39/.

A feasibility study report (FSR) in China is required to be developed by a third party accredited for this task by the government. An approval letter of the FSR is issued by the government only after the FSR passes the public assessment of the sector experts designated by the government. A FSR can thus be regarded as an accurate and trustworthy source of information coming from a recognized entity once it has the approval letter from the government.

The FSR for this project was developed by an accredited agency Central Mechanical International Engineering Design Institute in February 2008 /2/ and was approved by Hunan Province Economic Committee on 7 May 2008 /4/. DNV compared the input parameters for the financial analysis included in the PDD with the parameters stated in the FSR prepared by Central Mechanical International Engineering Design Institute, and was able to confirm that the values applied in the PDD /1/ are consistent with values stated in the FSR /2/.
The FSR was approved on 7 May 2008 /4/, only about six months prior to the commencement of the project activity (i.e. construction contract date), which was 3 November 2008 /10/. Given that relative short period of time between approval of FSR and construction contract of the project activity, it is unlikely in the context of the project that the input values would have materially changed and thus reasonable to assume that the FSR has been the basis of the decision to proceed with the investment in the project activity.

Investment Cost:
"Waste Coke Oven Gas Recovery and Utilization for Heating after Reconstruction of Kilns in the Loudi WUJO Industrial Co. Ltd" is the only project activity under validation using methodology AMS-III.Q version 4.0. Hence no investment cost comparison has been made with similar project activity – i.e. recovery of waste coke oven gas and use it via reconstruction of kilns for heating purpose only, whether currently under validation or registered.
The FSR, completed in February 2008 /2/ and approved on 7 May 2008 /4/ estimated total static investment (including the construction of the pipeline and the kiln reconstruction) was 48.29million RMB /2/. This investment cost is compared with construction contract cost of 19 million RMB for pipeline contraction from 'Pipe construction contact' issued by Lianyuan City Huiyuan Gas Co. Ltd. (COG supplier) and Changsha Laodaohe Construction Company on 1 December 2008 /22/ and 29.5 million RMB for kiln reconstruction from 'Kiln Construction Contract' issued by Loudi WUJO Industrial Co. Ltd and Lianyuan City Huiyuan Gas Co. Ltd /10/.
The kiln construction cost is cross checked with Gathering Receipt No. 3028891 dated 15 December 2009 for receipt of 29.5 million RMB issued by Lianyuan City Huiyuan Gas Co. Ltd /27/ and appears consistent with kiln construction contract.
The pipeline construction costs are cross checked with 'Construction Invoices' Invoice No. 5035140 dated 15 December 2009 for payment of 7 million RMB and Invoice No. 5035123 dated 3 October 2010 for payment of 12 million RMB /28/. Cross checking with kiln and pipe construction contracts and payment invoices and FSR estimated costs it appear that actual cost for kiln and pipeline construction is 48.5 million RMB, which is about 0.43% higher than total estimated cost (48.29 million RMB) and appears to be conservative.

Project revenue:
Project revenue is generated through the saved cost of purchasing coal and creating coal gas. The estimates of project revenue have been based on the data given in the FSR /2/.
As the project owner uses raw coal to create the coal gas burnt in the boilers at the facility, the coal gas production is dependent on the quantity of coal. An estimated coal gas price of 0.2/RMB/Nm^3 /30/ in FSR /2/ which includes the costs of producing coal gas from the purchased coal has been adopted in IRR assessment. Estimation of coal gas price is based on Coal gas price calculation evidence /30/ as detailed following:

Unit Coal consumption quantity in coal gas production: 0.728 kg/Nm^3
Unit water consumption quantity in coal gas in coal gas production: 0.982 kg/Nm^3
Unit Coal price: 270 RMB/tonne (excluding VAT), which is compared with coal price average of 206 RMB/tonne (including VAT) from coal purchase invoices /29/. The adopted coal price is conservative.
Unit Water Price: 1.755 RMB/tonne, which is compared with actual water price of 1.17 RMB/tonne as per Hunan Province Pricing Administration /31/. The adopted water price is conservative.
Coal gas annual consumption: 120,326,700 Nm^3

Unit cost of coal in coal gas production:
0.728 kg/Nm^3 * 270RMB/tonne/1000 = 0.19656 RMB/Nm^3 coal gas

Unit cost of water in coal gas production:
0.982 * 1.755/1000 = 0.00172 RMB/Nm^3

Coal gas production cost:
120,326,700 Nm^3 * (0.19656 + 0.00172) RMB/Nm^3 = 23,858,378 RMB/year

Staff cost:
10 staffs * 28,200/staff/year = 282,000 RMB. The staff salary is cross checked with staff salary (29 280 RMB/person/year) in Hunan Province /35/, and is conservative.

Equipment repair and maintenances: 400,000 RMB/year, which is corss checked with coal gas equipment maintenance and repaire service fee /36/.

Total cost:
23,858,378 + 282,000 + 400,000 = 24,540,378 RMB/year

Therefore, unit cost of coal gas:
24,540,378 /120,326,700 m^3 = 0.19828 RMB/Nm^3

A value of 0.2/RMB/Nm^3 in FSR has been considered in FSR /2/ which appears to be reasonable.

Taxes:

These were taken from the FSR /2/ and they are in line the current Chinese regulations. Tax rates have been crossed-checked with national laws and regulations as following:

- Tax rates account to 17% for VAT /57/,
- 25% for income tax /55/,
- 3% educational supplementary tax /54/,
- 7% for city construction and maintenance tax /56/.

O&M cost:

Operation and maintenance (O&M) cost comprised of three factors – repair cost, insurance and the pipe operation cost (cost of purchase and transport of COG and pipe operation and

maintenance) of 14.26 million RMB per year /7/ has been verified from approved FSR /2/. Following table provides breakdown of O&M cost and means of cross check by DNV.

Cost	Cost per year (10,000 RMB)	Cross check reference by DNV
Repair cost	45.29	FSR (p.55) /2/
Wage	0.00	n/a
Insurance	10.76	FSR (p.55) /2/
Low value consumables	0.00	n/a
Pipe operation cost The sum of: COG Collection and Transport Pipe Operation and Maintenance Costs	1370.00 1078.00 292.00	FSR (p.55) /2/
Interest	0.00	n/a
Total O&M cost	**1426.05**	**FSR (p.55)** /2/

Repair Rate and Insurance Costs:
The Repair cost of the project activity is calculated as 1% of the construction investment per year. It is verified that the repair cost (4.520 million RMB) sourced from FSR /2/.This is conservative as choice of repair rate when compared with registered projects /58/ using the same methodology AMS-III.Q. The table below gives the repair rate used in other recently registered projects using AMS-III.Q.

UNFCCC Project Number	Project Name	Repair Rate
5224	Zhonglian 4.5MW Waste Heat Power Generation Project in Hebei Province	4%
4208	Jiangxi Nanfang Cement Low Temperature Waste Heat Power Generation Project	1.5%
3564	Sichuan LiwanBusen Cement Waste Heat Recovery for Power Generation Project	4%
3832	Liaoning Chaoyang Waste Gas Recovery for Electricity Generation	2.5%
Proposed project	Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd.	1%

Additionally, it is verified that insurance cost of (1.076 million RMB) as sourced from FSR /2/ contribute only 0.25% of total O&M costs. Even when both these costs are omitted from the financial analysis, the benchmark only reaches 7.33% is still beneath the industry benchmark of 13% /53/. In DNV's opinion this is conservative.

Wages and Low Value Consumable:
As the project only involves a retrofit (to change the fuel source) of existing equipment, there is no requirement for additional employees or management resources following the implementation of the project activity. Therefore, no costs are allocated for the wages and

purchase of low value consumables (i.e. staff safety gear, travel expense etc.). In DNV's opinion this is conservative.

Pipe Operation Cost:
Based on the FSR (p.56) /2/;

- COG collection and maintenance cost (including purification): 10.78 million RMB/year
- Pipeline maintenance cost: 2.92 million RMB/year

The primary factor in the project's O&M cost is the COG transportation and pipeline maintenance. Purified COG is transported to the project site via a 27 km pipeline. The transportation fee is 0.15 RMB/m^3 (without VAT) (inclusive of the costs of purification) has been verified from COG supply agreement /18/. The unit price of COG 0.15 RMB/m^3 is also verified from COG Invoices issued by the Lianyuan City Huiyuan Gas Co. Ltd /26/.
Based on FSR (p.55) /2/:
After retrofitting, the consumption volume of COG is: 71,880,480 Nm^3
Based on the '*COG supply agreement*' (p.1) /18/, the COG cost is 0.15 RMB/Nm^3 (excludingVAT)
Therefore, COG usage cost is: 0.15RMB/Nm3 * 71,880,480 = 10.78 million RMB/year

Pipeline maintenance cost is verified from COG supply agreement /18/.

Calculation and conclusion
The IRR calculations were provided in a spreadsheet /7/. The calculations as well as its assumptions were verified and found to be correct by DNV. The IRR without CDM revenues was verified to be 5.38%, which confirms that the project in the absence of CDM benefits and compared to the benchmark of 13% /53/ is not financially attractive. With CER revenues the project-IRR increases to 18.38%, which exceeds the benchmark.

Sensitivity analysis
A sensitivity analysis has been carried out for parameters contributing more than 20% to revenues or costs to check the robustness of the financial analysis. Reasonable variations of the total investment, O&M cost, quantity of coal gas consumption and unit cost of coal gas were checked by calculating the variation necessary to reach the benchmark and then discussing the likelihood for that to happen. None of the parameters in the sensitivity analysis are considered to have any significant positive correlation.

DNV was able to verify that the project IRR will touch the benchmark only if the above mentioned parameters change by values as mentioned below:

Key Indicators	Variation of the parameter indicator needed to reach benchmark (IRR = 13%)
Total investment	-28.94%
O&M cost	-18.61%
Quantity of coal gas consumption	13.13%
Unit cost of coal gas	13.13%

Total investment: DNV was able to confirm that 28.94% decrease in investment costs is unlikely to happen. This is because fixed investment price has increased 1.50%, 3.09% and 8.90% in 2006, 2007 and 2008, respectively, and the average annual increased rate is 2.33% and this trend is likely to continue /59/. Additionally, DNV cross checked investment contracts /10//22/ and respective invoices for actual payments /27//28/ and found the contract costs as estimated in approved FSR /2/ remains unchanged. This made 28.94% decreases in investment cost impossible.

O&M cost: Operation and maintenance (O&M) cost comprised of three factors – repair cost, insurance and the pipe operation cost (cost of purchase and transport of COG and pipe operation and maintenance) of 14.26 million RMB per year /7/ has been verified from approved FSR /2/. It is not realistic that the annual O&M cost decreases by 18.61% due to raw material, fuel and energy prices showing an upward increase as 8.3%, 6% and 4.4% in 2005, 2006 and 2007, respectively /60/. Accordingly, the pipe maintenance cost and COG cost of collection and transportation is very likely to be increased. Therefore, it very unlikely to decrease the O&M costs to the threshold value of -18.61%.

Coal gas consumption and coal gas price: Amount of coal gas and coal price are directly related (i.e. cost of coal gas = coal gas volume * price) so a variation in either of these parameters will result in identical variation to the project IRR.

The main coal gas consumption equipment include: $45m^2$ glass furnace, $56m^2$ glass furnace, COG-burnt boiler, Lehre, Processing line, and Enamel converter /2/. There are 3 sets of water coal gas furnace and 3 sets of mixed coal gas furnace, which use coal as fuel and provide coal gas for the equipment. The equipment production capacity, heat efficiency and demand for coal gas remain unchanged. As a result, the total coal gas consumption cannot increase by 13.13%. Additionally, the project's Coal gas consumption was 120,326,700 Nm^3 in 2007, which is lower than coal gas consumption in 2006 (121,266,614 Nm^3) and in 2005 (122,142,559 Nm^3) as verified from Coal and Coal Gas Consumption records from 2005-2007/21/, which shows a decreasing trend.

As the project owner uses raw coal to create the coal gas burnt in the boilers at the facility, the coal gas production is dependent on the quantity of coal. Coal gas price of 0.2/RMB/Nm^3, which includes the costs of producing coal gas from the purchased coal has been verified from the 'Coal gas price calculation evidence' issued by the China Machinery International Engineering Design and Research Institute in May 2009 /30/. As the consumption of coal gas, and hence coal, is fixed, it is the coal price that will be most likely to effect the coal gas price.

In the estimation of the coal gas price, a coal price of 270 RMB/tonne (excluding VAT) has been adopted. This is conservative as the forgone costs of purchasing coal and creating coal gas represents the income of the project and thus it is prudent to cautiously overestimate income in the financial analysis of additionality. The average actual price of coal that the project pays is 206 RMB/tonne (including VAT) as verified from 'coal purchase invoices' issued to the PP /29/.

The second key aspect of the coal gas price calculation is water usage. As the coal gas usage is fixed, the amount of water required is also fixed. A conservative water price of 1.755 RMB/tonne has been used in the coal gas price calculation. The actual water price for industrial usage of 1.17 RMB/tonne has been verified from the 'Loudi water price evidence' issued by the Hunan Provincial Government Pricing Bureau /31/. Therefore the usage of 1.755 RMB/tonne in the coal gas price estimation is both reasonable and conservative.

Based on the conservative estimations of the factors underpinning the calculation of the coal gas price, the use of 0.2 RMB/Nm^3 in the financial analysis is considered reasonable. Furthermore, Loudi city is a main coal-mining zone in Hunan province and in China. So the coal price is comparatively low in China and is not likely to increase. Therefore, it is unlikely to increase the coal gas price to the threshold value of 13.13%.

The analysis above shows that only under very unrealistic circumstances, the IRR would reach the benchmark. Therefore, the sensitivity analysis confirms the robustness of the investment analysis and that project is not financially attractive.

In conclusion, the investment analysis and sensitivity assessment have shown that the project activity is not financially attractive.

4.6.4 Other barrier analysis

No other barrier has been demonstrated by PP.

4.6.5 Common practice analysis

This has not been addressed by the project participants as this is not required to be addressed as per the adopted methodology AMS-III.Q version 4.0.

The above investment barrier therefore makes it unlikely that the "Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co. Ltd" would be built in the absence of the CDM benefits and the project is thus not likely to be the baseline scenario. Moreover, the analysis of the investment barrier demonstrates that the continued use of coal gas as fuel for heat and releasing coke oven gas after incineration into the atmosphere.

4.7 Monitoring

The monitoring plan is in compliance with the adopted monitoring methodology 'Waste energy recovery (gas/heat/pressure) projects', AMS-III.Q, version 4.0 /40/.

The monitoring plan will give opportunity for real measurement of achieved emissions reductions. It is DNV's opinion, that the project participant is able to implement the monitoring plan

4.7.1 Parameters determined ex-ante

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

Parameters	**Unit**	**Value applied**	**Source of data used for verification**
Baseline efficiency of the element process/captive power plant/ cogeneration plant/mechanical energy	-	Glass furnaces: 0.89 Processing line: 0.82 Boiler: 0.89 Lehre: 0.88	Loudi WUJO Industrial Co., Ltd., 'The main equipments technical specifications', 1 March 2009 /20/.

conversion equipment $\eta_{EP,i,j}$		Enamel converter: 0.82	This is in accordance with the requirement of AMS-III.Q version 4.0 option (b) efficiency values provided by manufacturers.
project activity efficiency of the element process/captive power plant/ cogeneration plant/mechanical energy conversion equipment $\eta_{PJ,i}$	-	Glass furnaces: 0.93 Processing lines: 0.82 Boiler: 0.92 Lehres: 0.94 Enamel converter: 0.82	Loudi WUJO Industrial Co., Ltd., 'The main equipments technical specifications', 1 March 2009 /20/. This is in accordance with the requirement of AMS-III.Q version 4.0 option (b) efficiency values provided by manufacturers.
Annual yield of coke prior to the start of the proposed project activity, $Q_{BL,product}$	t	800,000	Annual yield of coke (400,000 tonnes from one coke oven) prior to the start of the proposed project activity is verified from COG discharging explanation' by Lianyuan Huiyuan Coking Co. Ltd /17/. This is in accordance to requirement of ACM00012 (version 04.0.0) /45/ Method (2) when measuring $Q_{BL,product}$.
Amount of waste energy (COG) per unit of product generated by the process (that generates waste energy) in the industrial facility, $q_{wcm,product}$	Nm^3/t	437.5	Amount of waste energy (COG) per unit of product generated by the process is verified from 'COG discharging explanation' by Lianyuan Huiyuan Coking Co. Ltd /17/.
Emission factor of baseline fuel (coal gas), $EF_{CO_2,coal\,gas}$	tCO_2e/TJ	44.4	Default value from IPCC 2006 /52/.
Net calorific value of COG NCV_{COG}	GJ/Nm^3	0.01760	Net calorific value of COG is verified from COG discharging explanation' by Lianyuan Huiyuan Coking Co. Ltd /17/.
Fraction of total heat generated by the project activity using waste energy f_{wcm}	%	100	This fraction is 1 if the heat generation is purely from use of waste energy. All of the thermal energy is generated by recovered COG, so $f_{wcm}=1$ Expected utilization of COG supply is about 71,880,000

			Nm^3/year as per COG Supply Agreement /18/, which is much lower than total COG produced of about 350,000,000 Nm^3 at Lianyuan Huiyuan Coking Co. Ltd /17/. Hence, this proves that all heat generation is purely from waste COG. This is in accordance with AMS-III.Q version 4.0 /40/.
Capping factor to exclude increased waste energy utilization in the project year y due to increased level of activity of the plant f_{cap}	-	1	f_{cap} is assumed to be 1 in ex-ante calculation of emission reductions, and will be adjusted in ex post calculation according to the $Q_{WCM,y}$ in monitoring. In accordance to AMS-III.Q version 4.0 /40/, this is appropriate.

The values chosen in determining the project and baseline emissions were verified and deemed acceptable by DNV.

4.7.2 Parameters monitored ex-post

According to the monitoring methodology of AMS-III.Q version 4.0 /40/ the following parameters will be monitored:

$Q_{wcm,y}$ (Amount of WECM (COG) recovered in year ***y***). The flow of waste gas (COG) is monitored by flow meter M1 (with precision ±0.35%) which is installed in the main pipeline of COG collection. The value is accumulated annually. The pressure $P_{COG,i}$ and temperature $t_{COG,i}$ is measured at the same time.

$Q_{COG,i,y}$ (Coke oven gas consumed by equipment ***i*** in year y). The compressed COG is transported via 27 km gas pipeline to gas-consuming equipment. The flow is monitored by a flow meter Mi (with precision ±0.35%) at the gas inlet of each equipment.

NCV_{COG} (Net calorific value of project fuel, coke oven gas). The net calorific value of COG is measured according to relevant national standards (Determination of Calorific Value of City Gas GB/T 12206-1990) by qualified laboratory with calibrated equipment. The sampling location of COG is the same as $Q_{COG,i}$ in monitoring location. This will ensure that the composition and quality of sample is the same as the ones of COG used by gas-consumed equipment. In addition, the net calorific value is compared with default values published by the IPCC.

$t_{COG,i}$ (Temperature of coke oven gas supplied to equipment ***i***). The temperature of COG is

monitored by thermometer which is installed in the pipeline.

$P_{COG,i}$ (Pressure of coke oven gas supplied to equipment ***i***). The pressure of COG is monitored by barometer which is installed in the pipeline.

4.7.3 Management system and quality assurance

Loudi WUJO Industrial Co. Ltd. will be in charge of constituting and carrying out monitoring plan. A specialized CDM management team will be formed by project entity. The general manager of the project entity will take charge of the monitoring management of the proposed project. A CDM Project Manager will be appointed and will be in charge of routine management of the monitoring plan, accomplishing the monitoring report. The monitoring personnel of the CDM management team will record monitoring data and archive them according to requirement of monitoring plan; the verifier will be in charge of checking and verifying the data. The Finance department and Production department will assist with verification data collection.

The precision level of the monitoring equipment installed in the project meets the standard as listed in following table. The project participant plans to calibrate of the monitoring equipments according to the equipment instructions and national standards.

Instrument	**Location**	**Parameter monitored**	**Precision**
Flow meter	Main pipe of COG collection	$Q_{wcm,y}$,	±0.35%
Flow meter	Entrance pipe of COG consumed facilities	$Q_{COG,i,y}$, $t_{COG,i}$, $P_{COG,i}$	±0.35%
Analysis equipments	Qualified laboratory	$NCV_{BF,k}$	GB standard

For monitoring of each parameter, two meters are installed. The first is responsible for taking primary measurements, whilst the second acts as a failsafe. If the primary meter is broken, the other can substitute in its place. To be conservative, the emission reductions during the period of equipment maintenance or replacement are not included in the total volume of emission reductions. A designated national organization will be responsible for equipment maintenance and calibration. The reliability of monitoring system is determined by precision and quality of measuring meter. The meters shall be purchased from professional manufacturers with national metering certificates and QA qualified pass. The meter shall be calibrated by qualified metering instrument institutions so as to assure the precision and steadiness of the metering results.

If any of the following situations happens, the equipment must be repaired and calibrated within 10 days after happening:

- Two sets of equipment readings exceed the permitted error margin.
- Any malfunction of equipment components.

The gas flow gauges for measurement in the project will be equipped in line with the standard of *Gas Flux Measurement in Closed Pipes – Turbine Flow Meter* (GB/T 18940-2003).

Data management will follow following steps:

- Electronic data and documents, including readings from meters connected to the computer central control system, will be kept at a special computer, and will be regularly copied and archived via optical discs and storage tapes.
- Written data and documents, including receipts for cross-checking of data, will be copied and archived with an explanation of the department or company. All paper-based information will be stored by the project owner and kept at least one electronic copy. Specific staff will be appointed by the project owner to take the overall responsibility for keeping the original copy
- Data recording, maintaining and archiving will be implemented in line with the *Quality Management System Standards* (GB/T-1 19001).

Internal verifier is responsible for checking and verifying the data regularly. The CDM Project Manager is responsible for checking the data management regularly (once a month). All the data collected as part of monitoring will be kept at least for two years after the end of the last crediting period.

4.8 Algorithms and/or formulae used to determine emission reductions

The emission reductions due to the project activity during the crediting period are equal to baseline emissions minus project emissions and leakages.

1) Baseline emission (BE_y)

Baseline emissions to provide thermal energy generated by waste energy ($BE_{Ther,y}$);

$$BE_{Ther,y} = f_{cap} * f_{wcm} * \sum_i \sum_j (HG_{j,y} + \mathrm{MG}_{i,j,y,tur} / \eta_{mech,tur}) * EF_{heat,j,y}$$

Where, $BE_{Ther,y} = BE_y$ is the baseline emission from thermal energy (as steam) during the year y in tons of CO_2

Determination of $HG_{j,y}$ The proposed project activity is reconstruction of kilns. These kilns are semi-opening systems and the temperature inside is very high (1230□±10□ before retrofitting and 1260□±10□ after retrofitting), which has been verified from Kiln temperature evidence issued by China International Engineering Design and Research Institute in May 2010 /32/. Additionally, the FSR developer the Central Mechanical International Engineering Design Institute has provided statement that the proposed project activity is reconstruction of kilns and these kilns are semi-opening systems with high temperature inside. Furthermore, the output temperature and pressure of the heat fluctuates significantly making it impossible to install monitoring equipment /3/. Using the volume of COG, the NCV of COG and the efficiency of the retrofitted equipment, the net quantity of heat supplied to the recipient facility can be determined /3/. Hence, $HG_{j,y}$ is measured as following:

$$HG_{\mathrm{i},y} = \mathrm{Q}_{\mathrm{COG},i.y} \times NCV_{COG} \times \eta_{PJ,i}$$

Where:

$Q_{COG,i,y}$	The compressed COG is transported via 27 km gas pipeline to gas-consuming equipment. The flow is monitored by a flow meter Mi (with precision ±0.35%) at the gas inlet of each equipments.
NCV_{COG}	Net calorific value of COG 0.01760 GJ/Nm^3 is verified from COG discharging explanation' by Lianyuan Huiyuan Coking Co. Ltd /17/.
$\eta_{PJ,i}$	Efficiency of equipment in project activity is verified from Loudi WUJO Industrial Co., Ltd., 'The main equipment technical specifications', 1 March 2009 /20/. This is in accordance with the requirement of AMS-III.Q version 4.0 option (b) efficiency values provided by manufacturers. Glass furnaces: 0.93 Processing lines: 0.82 Boiler: 0.92 Lehres: 0.94 Enamel converter: 0.82

Determination of $MG_{i,j,y,tur}$, there is no mechanical energy generated and supplied to the recipient *j*, which in the absence of the project activity, so the $MG_{i,j,y,tur} = 0$.

Determination of f_{cap}, capping factor to exclude increased waste energy utilization in the project year y due to increased level of activity of the plant, relative to the level of activity in the base years before project start. As per AMS-III.Q version 4.0, f_{cap} is estimated in accordance to the corresponding section of ACM0012 'Consolidated baseline methodology for GHG emission reductions from waste energy recovery project' /50/. In the project activity the waste COG is recovered and transported via a 27 km pipeline and directly utilized as a source of heat in WUJO facility as per approved FSR /2/. There is no detailed record of waste COG produced in Lianyuan Huiyuan Coking Co. Ltd. However, COG discharging explanation as prepared by Lianyuan Economic Bureau /17/, estimates amount of waste COG generates 437.5 Nm^3. Thus total 350,000,000 Nm^3 of COG is produced from two coke ovens in Huiyuan (each coke oven produced 400,000 tonnes of coking) /17/.

This complies with Method 2 as per ACM00012 /50/.

Thus f_{cap} is calculated as per $f_{cap} = \frac{Q_{WCM,BL}}{Q_{WCM,y}}$

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

Where,

$Q_{WCM,BL}$	Quantity of waste energy generated prior to the start of the project activity (Nm^3)
$Q_{WCM,y}$	Quantity of COG used for thermal energy generation in year *y* (Nm^3). The flow of waste gas (COG) is monitored by flow meter M1 (with precision ±0.35%) which is installed in the main pipeline of COG collection. The value is

accumulated annually. The pressure $P_{COG,i}$ and temperature $t_{COG,i}$ is measured at the same time.

$Q_{BL,product}$ — Annual yield of coke (800,000 tonnes from two coke ovens) prior to the start of the proposed project activity is verified from COG discharging explanation' by Lianyuan Huiyuan Coking Co. Ltd /17/.

$q_{wcm,product}$ — Amount of waste energy (COG) per unit of coking product generated (437.5 Nm^3/t) by the process is verified from 'COG discharging explanation' by Lianyuan Huiyuan Coking Co. Ltd /17/

Determination of f_{wcm} , the fraction of total heat generated by the project using waste energy. f_{wcm} is determined 1 as all of the thermal energy us generated by recovered COG. Expected utilization of COG supply of 71,880,000 Nm^3/year according to COG supply agreement /18/, which is much lower than total COG produced of about 350,000,000 Nm^3 at Lianyuan Huiyuan Coking Co. Ltd /17/. Hence, this proves that all heat generation is purely from waste COG.

Determination of $EF_{heat,j,y}$

$$EF_{heat,j,y} = \sum_i ws_{i,j} \frac{EF_{CO2,i,j}}{\eta_{EP,i,j}}$$

Where:

$EF_{CO2,i,j}$ — The 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

$\eta_{EP,i,j}$ — Efficiency of the i^{th} element process that would have been supplied heat to j^{th} recipient in the absence of the project activity

$ws_{i,j}$ — Fraction of total heat that is used by the recipient j in the project that in the absence of the project activity would have been supplied by the i^{th} boiler

In the absence of the project activity, all the heat that is used by the recipient in the project that have been supplied by the water coal gas boiler, so the $ws_{i,j}$ = 1. This is further demonstrated in CL 8 and CL 9 that reconstruction of kilns will not increase in electricity consumption. Additionally, no fossil fuel will be co-fired since the total COG production capacity of Huiyuan coke-oven plant of amount 350,000,000 Nm^3/year /17/ is much higher that the amount of COG used in this project activity of 71,880,000 Nm^3/year /18/. This confirms that the COG supply is sufficient to satisfy the demand for COG from the project. Additionally, there is a 20,000 Nm^3 COG gas cabinet that can store and adjust the supply of COG /2/. In case of project downtime, consumption of grid electricity is not required and the COG gas in the gas cabinet is a timely energy supplement source. It is not necessary to monitor the consumption of grid electricity.

The water coal gas is the only fuel used in the baseline scenario, and according to the default value in IPCC 2006, the CO_2 emission factor per unit of energy of the baseline fuel is 44.4 tCO_2/TJ.

Efficiency of the element process $(\eta_{EP,i,j})$ shall be one of the following:

(a) Assume a constant efficiency of the element process and determine the efficiency, as a conservative approach, for optimal operation conditions i.e. design fuel, optimal load, optimal oxygen content in flue gases, adequate fuel conditioning (temperature, viscosity, moisture, size/mesh etc.), representative or favourable ambient conditions (ambient temperature and humidity); or

(b) Highest of the efficiency values provided by two or more manufacturers for element process with specifications similar to that which would have been required to supply the recipient with heat that it receives from the project activity; or

(c) Maximum efficiency of 100%.

The constant efficiency of the each element process *i* is determines by Option (a). The is estimated assuming optimal operation conditions, i.e. design fuel, optimal load, optimal oxygen content in flue gases, adequate fuel conditioning (temperature, viscosity, moisture, size/mesh etc.). In baseline energy efficiency for the five elemental processes is verified from Kiln test report issued by Changsa City Energy Utilization Monitoring Station /33/.

Elemental process	Efficiency
The Glass furnaces	0.89
Processing lines	0.82
Boiler	0.89
Lehres	0.88

2) Project emission (PE_y)

As defined by the methodology AMS-III.Q version 4.0, project emissions include emissions due to combustion of auxiliary fuel to supplement waste gas and emissions due to consumption of electricity by the project activity. If the waste gas contains carbon monoxide or hydrocarbons, other than methane, and the waste gas is vented to the atmosphere in the baseline situation, project emissions have to include CO_2 emissions due to the combustion of the waste gas.

In the absence of the project (baseline), the waste COG was released into the atmosphere after incineration, which has been verified from 'the main equipment technical specifications' issued by Loudi WUJO Industrial Co. Ltd /20/. There is no supplemental fossil fuel and electricity consumption in the proposed project activity as demonstrated in CL 8 and CL 9. It is further demonstrated that the COG supply is sufficient to satisfy the demand for COG from

the project. There is a 20,000 Nm^3 COG gas cabinet that can store and adjust the supply of COG /2/. In case of project downtime, consumption of grid electricity is not required and the COG gas in the gas cabinet is a timely energy supplement source. Therefore, according to the methodology AMS-III.Q (version 4.0), emissions due to the combustion of the waste COG is excluded and no additional emissions due to operation of the project activity has been considered..

Therefore, project emissions $\boldsymbol{PE_y = 0}$

3) **Leakage emission ($\boldsymbol{LE_y}$)**

As per methodology AMS-III.Q version 4.0, if equipment to be used in the project activity is currently being utilised elsewhere and is transferred from outside the boundary to the project activity, leakage is to be considered.
In the proposed project activity, equipments currently being utilized are not transferred from outside the boundary to the project activity /1//2/.

Therefore leakage emission $\boldsymbol{LE_y = 0}$

34) Emission reductions

The emission reduction achieved by the project activity will be calculated as the difference between the baseline emissions and the project emissions.

$$\boldsymbol{ER_y = BE_y - PE_y - LE_y}$$

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 57 461 tCO_2e per year for the selected crediting period.

All assumptions and data used by the project participants are listed in the PDD and supporting documents, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD. All values used in the PDD are considered reasonable in the context of the proposed CDM project activity. The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.

4.9 Environmental impacts

An Environmental Impact Assessment Report (EIA) of the project activity has been conducted by Loudi Environmental Protection Research Institute in 4 May 2008 /5/. The potential environmental impacts, such as waste water, noise and waste gas, have been sufficiently identified and documented in the PDD. The air impact, noise impact, waste water treatment method, solid waste impacts have been fully addressed in the PDD in consistence with the EIA assessment. No significant environmental impacts are envisaged in the project activity based on EIA. Hunan Environmental Protection Bureau approved the EIA on 5 May 2008 /6/.

4.10 Comments by local stakeholders

Besides the stakeholder consultation process required by Chinese EIA regulations, an additional stakeholder consultation process has been performed. A public stakeholder meeting was conducted on 08 January 2009 to invite the comments from the residents, local authorities near the project area /15/. The project owner has received 50 copies of completed questionnaires /15/ and no negative comment was received. DNV thus considers the 50 questionnaires are reasonable to represent all local stakeholders near the project site.

The survey showed that the proposed project received support from local stakeholders, which was confirmed by verifying the questionnaires by DNV /15/.

DNV considers the local stakeholder consultation being carried out adequately.

4.11 Comments by Parties, stakeholders and NGOs

The PDD, version 03 dated 8 October 2010 /1/, was made publicly available on the CDM website and Parties, stakeholders and NGOs were through the CDM website (http://cdm.unfccc.int/Projects/Validation/DB/RH10CCFHHW8Y2S5B1TY2183GEBHV4Z/view.html) invited to provide comments during a 30 days period from 20 October 2010 to 18 November 2010.

No comments were received during that period.

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APPENDIX A

CDM VALIDATION PROTOCOL

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

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	OK
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	OK
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	OK
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	OK
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	OK
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedures §31b	OK
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if 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	
17. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK
18. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK

Table 2 Requirements checklist

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	General description of project activity					
	Title of the project activity (VVM para 55-57)					
1.0.1	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
1.0.2	Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	☒ Yes		OK
	Description of the project activity (VVM para 58-64)					
1.1.1	How was the design of the project assessed?	/1/	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 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		OK

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

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				this case, DOE may not conduct a physical site visit as appropriate. ☒ Greenfield project The proposed project is a Greenfield project, which was verified against the FSR and FSR approval /2/. ☒ Physical site inspection ☒ Reviewing available designs and feasibility studies		
1.1.2	If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/ /13/	DR I	The Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd has been operated in July of 2010.		OK
1.1.3	If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year), justify the sampling through a statistical analysis:	/1/	DR	Not applicable.		OK
1.1.4	Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	/1/	DR	Yes. The description in the PDD covers all relevant elements, such as the location and provides a clear understanding of the nature of the proposed CDM project activity.		OK
1.1.5	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/ /2/	DR I	Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd is a new built project and there is no alternation which was confirmed during the Site Visit. It can also be proved by the approved FSR /2/.		OK
1.1.6	Does the project design engineering reflect current good practices?	/1/	DR I	Yes. The project design engineering reflects current good practice.		OK
1.1.7	Would the technology result in a significantly better	/1/	DR	According to the purchase agreements reviewed		OK

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

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	performance than any commonly used technologies in the host country? Is any transfer of technology from any Annex-I Party involved?	/12/	I	during the Site Visit, the equipment used by the PP is all made in China. Therefore there are not elements indicating that the technology used by the PP will result in significantly better performances that the commonly used in China.		
1.1.8	Does the project qualify as a small scale CDM project activity as defined in paragraph 6(c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/1/ /2/ /63/	DR I	Yes, the project qualifies as a small scale CDM project activity as defined in paragraph 6(c) of decision 17/CP.7 on the modalities and procedures for the CDM.		OK
1.1.9	Is the small scale project activity a debundled component of a larger project activity?	/1/ /63/	DR I	The small scale project activity is not a debundled component of a larger project activity.		OK
	Participation requirements (VVM para 51-54, 123-125)					
1.2.1	Do all participating Parties fulfil the participation requirements as follows:	/1/	DR	The host Party is China and the Annex I Party is the United Kingdom of Great Britain and Northern Ireland. Both Parties fulfil the participation criteria and have approved the project and authorized the project participants. The DNA of China has confirmed that the project assist in achieving sustainable development.		OK
				China (host) / UK (Annex I)		
	a) Party has ratified the Kyoto Protocol			☒ Yes ☐ No / ☒ Yes ☐ No		
	b) Party has designated a Designated National Authority			☒ Yes ☐ No / ☒ Yes ☐ No		
	c) The assigned amount has been determined			☒ Yes ☐ No / ☒ Yes ☐ No		
1.2.2	Do the letters of approval meet the following requirements?	/1/	DR	Both Parties fulfil the participation criteria and have approved the project and authorized the project participants. The DNA of China has confirmed that the project assist in achieving sustainable development.		OK
				China (host) / The United Kingdom of Great		OK

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

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Britain and Northern Ireland (Annex I)		
a) LoA confirms that Party has ratified the Kyoto Protocol	☒ Yes ☐ No		☒ Yes ☐ No		
b) LoA confirms that participation is voluntary	☒ Yes ☐ No		☒ Yes ☐ No		
c) The LoA confirms that the project contributes to the sustainable development of the host country?	☒ Yes ☐ No		NA		
d) The LoA refers to the precise project activity title in the PDD	☒ Yes ☐ No		☒ Yes ☐ No		
e) The LoA is unconditional with respect to (a) to (d) above	☒ Yes ☐ No		☒ Yes ☐ No		
f) The LoA is issued by the respective Party's DNA	☒ Yes ☐ No		☒ Yes ☐ No		
g) The LoA was received directly by the DNA or the PP	☐ DNA ☒ 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	By checking the link from NDRC, DNA of China, DNV can verify the authenticity of LoA from China: http://cdm.ccchina.gov.cn/website/CDM/pdf/Item_new/Item_new5363.pdf				
1.2.3 Have all private/public project participants been authorized by an involved Party?	/1/	DR	The project participants are Loudi WUJO Industrial Co. Ltd. of China and the Originate Carbon Ltd of the United Kingdom of Great Britain and Northern Ireland. The host Party (China) and the Annex I Party (the United Kingdom of Great Britain and Northern Ireland) meet all relevant participation requirements. The letters of approval (LoAs) /37/ /38/ were issued by DNA of China on 29 July 2010,		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			authorizing Loudi WUJO Industrial Co. Ltd. and DNA of the United Kingdom of Great Britain and Northern Ireland on 16 September 2010., authorizing Originate Carbon Ltd, respectively.		
Technical description of the project activity (VVM para 58-64)					
1.3.1 Is the project's location clearly defined?	/1/	DR I	Yes. The proposed project is located in Shimen Industry Park, Maotang Town, lianyuan, Hunan Province, The People's Republic of China. The central geographical coordinates of the project is at longitude of 111°74′58″E and latitude of 27°76′31″N.		OK
Public funding of the project activity					
1.4.1 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 I	The investment of Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd. is all from Loudi WUJO Industrial Co. Ltd. The project does not involve any public funding from an Annex I Party, and the validation did not reveal any information that indicated that the project can be seen as a diversion of official development assistance (ODA) funding towards China. All project funding comes from equity.		OK
Application of a baseline and monitoring methodology					
Methodology applied (VVM para 65-76)					
2.0.1 Does the project apply an approved methodology and the correct version thereof?	/1/ /40/	DR	Yes. The approved methodology AMS-III.Q "Waste energy recovery (gas/heat/pressure) Project" version 03 is applied for the proposed		OK

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

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				project /40/.		
2.0.2	If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?		DR	Not applicable.		OK
	Applicability of methodology (and tools) (VVM para 65-76) *Insert a row for each applicability criteria of the applied methodology (and tools)*					
2.1.1	How was it validated that project complies with the following applicability criteria 1: The category is for project activities that utilize waste gas and/or waste heat at existing facilities as an energy source for: (a) Cogeneration; or (b) Generation of electricity; or (c) Direct use as process heat; or (d) For generation of heat in elemental process (e.g., steam, hot water, hot oil, hot air); (e) For generation of mechanical energy.?	/1/ /2/ /40/	DR I	The project activity that utilize waste oven gas at existing coke production plant as an energy source for generation of heat.		OK
2.1.2	How was it validated that project complies with the following applicability criteria 2: The category is also applicable to project activities that use waste pressure to generate electricity at existing facilities?	/1/ /2/ /40/	DR I	According to FSR, the waste pressure is not used.		OK
2.1.3	How was it validated that project complies with the following applicability criteria 3: The recovery of waste gas/heat may be a new initiative or an incremental gain in an existing practice?	/1/ /2/ /40/	DR I	The recovery of waste oven gas is an incremental gain in the coke production plant involved. This is confirmed during site inspection that gas pipeline construction was complete as part of the reconstruction of the kilns in Shimen Industrial Park.		OK
2.1.4	How was it validated that project complies with the following applicability criteria 4: In case the project activity is an incremental gain, the difference between the technology used before project activity implementation and the project technology should be clearly shown. It should be demonstrated why there are barriers for the project activity	/1/ /2/ /40/	DR I	It was demonstrated in section B.5 investment analysis. The project activity is an incremental gain in an existing coke production facility. The difference		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	that did not prevent the implementation of the technology used before the project activity implementation?			between the technology used before project activity implementation and the project technology is demonstrated via investment barrier. IRR of the project activity without CDM revenue (5.65%) is less than IRR of the project activity with CDM revenue (16%). This is further substantiated by sensitivity assessment that decreasing 10% of operation cost by 10% (IRR 9.84%) or increasing 10% of quantity of coal consumption and 10% of unit costs of coal gas the IRR (11.53%) is less than benchmark 13%.		
2.1.5	How was it validated that project complies with the following applicability criteria 5: Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually. Wherever the measures lead to waste heat recovery which is incremental to an existing practice of waste heat recovery, only the incremental gains in GHG mitigation should be taken into account and such incremental gains shall result in emission reductions of less than or equal to 60 kt CO2 equivalent annually.	/1/ /2/ /40/	DR I	The estimated emission reduction 57 610 tCO_2e/year in the PDD publicly available on the EB's website.		OK
B.1.6	How was it validated that project complies with the following applicability criteria 6: The category is applicable under the following conditions: (a) The energy produced with the recovered waste gas/heat or waste pressure should be measurable; (b) Energy generated in the project activity may be used within the industrial facility or exported to other industrial facilities (included in the project boundary); (c) Electricity generated in the project activity may be exported to the grid or used for captive purposes. However, the methodology is not applicable to projects where the	/1/ /2/ /40/	DR I	(a) The energy produced with the recovered waste oven gas will be measured. (b) Energy generated in the project activity is used within the industrial facility. (c) The project does not include electricity generation. (d) The emission reductions are claimed by Loudi WUJO Industrial Co. Ltd who is the generator of thermal energy using waste coke oven gas. (e) N/A	~~CAR 1~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
waste gas/heat recovery project is implemented in a single-cycle power plant (e.g., gas turbine or diesel generator) where heat generated on site is not utilizable for any other purposes on-site except to generate power. The projects recovering waste energy from such power plants for the purpose of generation of heat only can apply this methodology; (d) The emission reductions are claimed by the generator of energy using waste energy; (e) In cases where the energy is exported to other facilities (included in the project boundary), the following are required: (i) All historical information from the recipient plants; (ii) An official agreement exists between the owners of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by the recipient plant(s) for using a zero-emission energy source; (f) For those facilities and recipients included in the project boundary, that prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods: (i) The remaining lifetime of equipments currently being used; and (ii) Crediting period. (g) The waste gas/heat or waste pressure utilized in the project activity would have been flared or released into the atmosphere in the absence of the project activity. This shall be proven by one of the following options: (i) By **direct measurements** of energy content and amount			The corrective actions are requested on the project's compliance with the applicability criteria of the applied methodology as follows: • For determining the time periods for which the emission reduction credits can be claimed, the remaining lifetime of equipments currently being used is requested to be demonstrated and compared with the crediting period. • The waste coke oven gas utilization status in the absence of the project activity needs to be proven by one of the designated options provided in the applied methodology.		

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	of the waste gas/heat or waste pressure for at least three years prior to the start of the project activity. (ii) **Energy balance** of relevant sections of the plant to prove that the waste gas/heat or waste pressure was not a source of energy before the implementation of the project activity. For the energy balance the representative process parameters are required. The energy balance shall demonstrate that the waste gas/heat or waste pressure was not used and also provide conservative estimations of the energy content and amount of waste gas/heat or waste pressure released. (iii) **Energy bills** (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g., based on specific energy consumption specified by the manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g., balance sheets, profit and loss statement) that no energy was generated by waste gas/heat or waste pressure and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities.					
2.1.7	How was it validated that project complies with the following applicability criteria 7: For the purpose of this category waste energy is defined as: a by-product gas/heat/pressure from machines and industrial processes having potential to provide usable energy, for which it can be demonstrated that it was wasted. For example gas flared or released into the atmosphere, the heat or pressure not recovered (therefore wasted). Gases that have intrinsic value in a spot market as energy carrier or chemical (e.g., natural gas, hydrogen, liquefied petroleum gas, or their substitutes) are not eligible under this category	/1/ /2/ /40/	DR I	The project prior to implementation of the project activity, the waste coke oven gas from coke ovens were released into the atmosphere after incineration. DNV confirms that the waste coke oven gas utilized in the proposed project is in compliance with the methodology		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
2.1.8	Is the selected baseline one of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/ /2/ /40/	DR I	It would be concluded after CAR 1 is closed. The selected baseline is as per methodology, hence aconfirms the applicability of the methodology.		OK
	Project boundary (VVM para 78-80)					
2.2.1	What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/	DR	The project's system boundary is delineated and in line with the Approved Consolidated Methodology AMS-III.Q ver. 03. The project's system boundary consist of the coke ovens in Huiyuan, glass furnaces, lehres, processing lines, boiler, enamel converter and other auxiliary facilities in WUJO and a set of gas pipes with a length of 27 km from Huiyuan to WUJO.		OK
2.2.2	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/ /40/	DR	The major emission source of Baseline and Project activity is CO_2 and this is in line with the approved methodology AMS-III.Q. Baseline Emissions: CO_2 emissions for thermal energy generation in the NCPG. Project Emissions: CO_2 emissions for CO_2 for supplemental electricity consumption. According to the FSR there is not supplemental fossil fuel consumption for auxiliary equipment included in the project activity and there is not contemplated the cleaning of the waste gas. For the project activity the only source to be accounted for is the electricity consumption.		OK
2.2.3	Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/1/	DR	There is no other emission sources involved in. And there is also no other sources contribute more than 1% of the estimated emission reductions of the project.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Baseline scenario determination (VVM para 81-88, 105-107) *Ensure that the evaluation of all alternatives provided in the PDD and required by the methodology and also possible alternatives/offshoots of alternatives are discussed. Check that all alternatives required to be considered by the methodology are included in the final PDD. If baseline alternatives required to be considered by the methodology are considered not applicable, please assess the justification for this.*					
2.3.1 Which baseline scenarios have been identified? Is the list of baseline scenarios complete?	/1/ /41/	DR	No baseline alternative scenarios have been described in the PDD. The project participant requires demonstrating the baseline alternative scenarios in the PDD as per the methodology AMS-III.Q ver 03.	~~CL 1~~	OK
2.3.2 How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR	No baseline alternative scenarios have been described in the PDD.	~~CL 1~~	OK
2.3.3 What is the baseline scenario?	/1/	DR	The baseline scenario as per PDD is using coal gas as fuel of glass furnaces, lehres, boiler, processing line and enamel converter and that coke oven gas is released into the atmosphere after incineration. No other baseline alternative scenarios have been described in the PDD.		OK
2.3.4 Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/ /40/	DR	No baseline alternative scenarios have been described in the PDD in accordance with the guidance in the methodology AMS-III.Q ver.03. See above B.4.1	~~CL 1~~	OK
2.3.5 Has the baseline scenario been determined using	/1/	DR	No baseline alternative scenarios have been	~~CL 1~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	conservative assumptions where possible?		I	described in the PDD in accordance with the guidance in the methodology AMS-III.Q ver.03. See above B.4.1		
2.3.6	Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/ /40/	DR	No baseline alternative scenarios have been described in the PDD in accordance with the guidance in the methodology AMS-III.Q ver.03. See above B.4.1	~~CL 1~~	OK
2.3.7	Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	No baseline alternative scenarios have been described in the PDD in accordance with the guidance in the methodology AMS-III.Q ver.03. See above B.4.1	~~CL 1~~	OK
2.3.8	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	No baseline alternative scenarios have been described in the PDD. The project participant requires demonstrating the baseline alternative scenarios in the PDD as per the methodology AMS-III.Q ver 03. See above B.4.1	~~CL 1~~	OK
	Additionality determination (VVM para 94-121)					
2.4.1	What approach/tool does the project use to assess additionality? Is this in line with the methodology?	/1/ /40/	DR	The tool used to assess additionality is "Tool for the demonstration and assessment of additionality" version 05.2. Yes. All the process of analysing the additionality in the PDD is in line with the methodology AMS-		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				III.Q version 03 /40/.		
2.4.2	Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/ /2/	DR I CC	Yes. The relevant regulatory requirements have been taken into account consideration.		OK
2.4.3	Is sufficient evidence provided to support the relevance of the arguments made?	/1/ /2/	DR	Yes. The evidence provided is sufficient to support the relevant arguments /2/ .		OK
2.4.4	What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/	DR	The project additionality is mainly based on the investment analysis /1/.		OK
	Prior consideration of CDM (VVM para 98-103)					
2.4.5	What is the evidence for serious consideration of CDM prior to the time of decision to proceed with the project activity?	/1/ /14/	DR I	In Chinese LoA, the project participant's name appears as Loudi WUJIANG Industrial Co., Ltd. in Chinese LOA'. But in notification to UNFCCC, the project participant's name appears as Lengshuijiang Steel & Iron Co., Ltd. Father clarification is requested with regard to project participant's name.	~~CAR 2~~	OK
2.4.6	If the starting date is after 2 August 2008 and before the global stakeholder consultation, has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM status?	/1/	DR	See above B.5.5		OK
	Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)					
2.4.7	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	N/A		OK
2.4.8	When did the construction of the project activity start?	/1/	DR	N/A		OK
2.4.9	When was the project commissioned?	/1/	DR	N/A		OK
2.4.10	Does the timeline of the project confirm that continuous	/1/	DR	N/A		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	actions in parallel with the implementation were taken to secure CDM status?	/2/ /10/ /12/ /13/ /14/ /15/	I CC			
	Investment analysis (VVM para 108-114) *The list of questions below must be adjusted to the parameters in the investment analysis relevant to the project under validation.*					
2.4.11	Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/1/ /2/ /7/	DR	N/A		OK
2.4.12	Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR	N/A		OK
2.4.13	Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	Benchmark analysis has been adopted by project participant as an indicator to demonstrate investment barrier. . Project participant is requested to demonstrate not adopting investment comparison analysis in the PDD.	~~CL 2~~	OK
2.4.14	Is the benchmark/discount rate the latest available at the time of decision?	/1/ /53/	DR I CC	The benchmark in Chinese Light Industry projects is 13 % (before tax) which is based on "the Economic Assessment method and Parameters for Construction Project, the third edition" and the core business of Loudi WUJO Industrial Co. Ltd is Light Industry projects. This is invalid at the time of decision.		OK
2.4.15	What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/ /7/ /53/	DR	The financial indicator is equity IRR after tax. The IRR calculations were provided in a spreadsheet /7/. The financial indicator is in		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				correspondence with the benchmark /53/.		
2.4.16	Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/1/	DR	Yes. The waste coke gas is released into the atmosphere after incineration in the absence of the proposed project. It was not accounted for the cost of this project.		OK
2.4.17	Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/1/ /2/. /7/	DR I	The income tax calculation takes into consideration both the depreciation of fixed assets and the amortization of the intangible assets. The income tax calculation takes depreciation into account /7/. The depreciation year is 10 years with the fixed residual rate 5% /2/.		OK
2.4.18	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/ /2/. /7/	DR CC	It has been considered an asset life of 10 years and a project operating life of 10 years. The asset salvage value after the 15 years and the working capital has been considered in the Cash Flow calculation.		OK
2.4.19	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/ /2/ /7/ /10/	DR CC	Yes. The input parameters used in the financial analysis of the "Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd." are taken from the feasibility study report (FSR) developed by Central Mechanical International Engineering Design Institute dated February 2008 and approved by Hunan Province Economic Committee dated 7 May 2008 /2/. The input parameters used in the financial analysis can thus be considered information provided by an independent and recognized source. DNV compared the input parameters for the financial analysis /7/ included in the PDD with the parameters stated in the FSR /2/ and was able		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				to confirm that the values applied are consistent with the values stated in the FSR /2/. The FSR was prepared by Central Mechanical International Engineering Design Institute dated February 2008 and approved by Hunan Province Economic Committee dated 7 May 2008 /2/. Thus it is less than nine months prior to the decision to proceed with the project activity (i.e. project start date) which was on 16 November 2008 /10/. Given this relative short period of time between approval of the FSR and the decision to proceed with the project activity, it is unlikely in the context of the project that the input values would have materially changed and that it is thus reasonable to assume that the FSR has been the basis of the decision to proceed with the investment in the project.		
2.4.20	How was the amount of output (e.g. quantity of coal gas consumption) assessed? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /7/	DR	☒ The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval ☒ The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) ☐ Other approach. *Provide details on how the load factor was validated:* In FSR, it was mentioned that the efficiency of the thermal energy generation facility: Glass furnaces: ***0.93%*** Processing lines: ***0.82%***	~~CL 3~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Boiler: ***0.92%*** Lehres: ***0.94%*** Enamel converter ***0.82%*** It needs to clarify the suitability of PLF in financial analysis.		
2.4.21	How was the output price (e.g. cost of coal gas) assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /7/	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 *Provide details on how the output price was validated:* At the time of the investment decision the coal gas tariff used (RMB 0.20/Nm^3). Further clarification is requested on this coal gas tariff (RMB 0.20/Nm^3).	~~CL 4~~	OK
2.4.22	How were the investment costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /7/	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 project participants The investment cost of the project activity as in PDD is 48 293 000 RMB which is in consistent with in FSR. Clarification is requested with regard to suitability of investment cost in financial analysis with sufficient evidence of investment cost estimate.	~~CL 5~~	OK
2.4.23	How were the O&M costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been	/1/ /7/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☒ Review of feasibility reports, public	~~CL 6~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	used for cross-checking in accordance with VVM paragraph 95.			announcements and annual financial reports related to the project and the project participants Clarification is requested with regard to O&M cost adopted in financial analysis		
2.4.24	Describe the assessment of the other input parameters. Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /7/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☒ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants The tax calculation has been done according the following Chinese legislation: Interim Regulation of the People's Republic of China on Value Added Tax, the tax rate is 17%; The Implementation Rules for the Corporate Income Tax Law of the People's Republic of China, the tax rate is 25%; Provisional Regulations of the People's Republic of China on City Maintenance and Construction Tax, the tax rate is 7% of value added tax; Interim Regulation of the People's Republic of China on surtax for education expenses, the tax rate is 3% of value added tax.		OK
2.4.25	Was the financial calculation spreadsheet verified and found to be correct?	/1/ /7/	DR	Refer to CL 2, CL 3, CL 4 CL 5. CL 6	~~CL 2~~ ~~CL 3~~ ~~CL 4~~ ~~CL 5~~ ~~CL 6~~	OK
2.4.26	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/ /7/	DR CC	The variable rate for each parameter which will make the IRR exceed the benchmark should be calculated and the likelihood to happen should be substantiated.	~~CL 7~~	OK
2.4.27	Sensitivity analysis: Is the range of variations is reasonable	/1/	DR	Yes. The sensitive analysis contains the variation		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	in the project context?	/7/		-10% to +10% and also the variation to the benchmark.		
2.4.28	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 variable rate for each parameter which will make the IRR exceed the benchmark should be calculated and the likelihood to happen should be substantiated. See above B.5.26	~~CL 7~~	OK
	Barrier analysis (VVM para 115-118)					
2.4.29	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	N/A		OK
2.4.30	How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR	N/A		OK
2.4.31	How does CDM alleviate the investment barriers?	/1/	DR	N/A		OK
2.4.32	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 circumstances?	/1/	DR	N/A		OK
2.4.33	How were the technological barriers assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/	DR	N/A		OK
2.4.34	How does CDM alleviate the technological barriers?	/1/	DR	N/A		OK
2.4.35	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	N/A		OK
2.4.36	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	N/A		OK
2.4.37	How does CDM alleviate the barriers due to prevailing	/1/	DR	N/A		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	practise?					
2.4.38	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	N/A		OK
2.4.39	How were the other barriers assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/1/	DR	N/A		OK
2.4.40	How does CDM alleviate the other barriers?	/1/	DR	N/A		OK
2.4.41	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	N/A		OK
	Common practice analysis (VVM para 119-121)					
2.4.42	What is the geographical scope of the common practice analysis? Is this justified?	/1/	DR	N/A		OK
2.4.43	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/	DR I	N/A		OK
2.4.44	What is the data source(s) used for the common practice analysis?	/1/	DR I	N/A		OK
2.4.45	How many similar non-CDM-projects exist in the region within the scope?	/1/	DR	N/A		OK
2.4.46	How were possible essential distinctions between the project activity and similar activities assessed?	/1/	DR	N/A		OK
2.4.47	What is the conclusion of the common practice analysis?	/1/	DR	N/A		OK
	Conclusion					
2.4.48	What is the conclusion with regard to the additionality of the project activity?	/1/	DR	The conclusion will be generated as soon as the above CLs/CARs resolved.	~~CL 2~~ ~~CL 3~~ ~~CL 4~~ ~~CL 5~~	OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
					~~CL 6~~ ~~CL 7~~	
	Calculations of GHG emission reductions					
	Data and parameters that are available at validation and that are not monitored (VVM para 199-203)					
2.5.1	How was the $Q_{BL,product}$ (Annual yield of coke prior to the start of the proposed project activity) verified?	/1/ /2/	DR	It is 800 000T which is from FSR. Based on the public information available, DNV considers the value is reasonable.		OK
2.5.2	How was the $q_{wcm,BL}$ (Amount of waste energy (COG) per unit of product generated by the process (that generates waste energy) in the industrial facility)in year y verified?	/1/	DR	It is 437.5 Nm^3/t which is from Manufacturers specification.		OK
2.5.3	How was the baseline efficiency of the element process conversion equipment verified?	/1/	DR	The baseline efficiency of the element process conversion equipment was referenced from Manufacturers specification.		OK
2.5.4	How was the CO_2 emission factor of fossil fuel type i in year yverified?	/1/ /52/	DR	The CO_2 emission factor of fossil fuel type in year was referenced from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.		OK
2.5.5	How was the capping of baseline emissions (f_{cap}) verified?	/1/	DR	The capping of baseline emissions (f_{cap}) has been calculated as per Case-1 of Method-2 in the approved consolidated methodology ACM0012 ver. 3.2. For such case, f_{cap} is the ratio of maximum theoretical energy recoverable using the project activity waste oven gas recovery equipment and actual energy recovered under the project activity (using direct measurement). The formula is following: $f_{cap} = \frac{Q_{WCM,BL}}{Q_{WCM,y}}$ Where:		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				$Q_{WCM,BL}$ = Quantity of waste energy generated prior to the start of the project activity (Nm^3) $Q_{WCM,y}$ = Quantity of WECM (COG) used for energy generation in year y (Nm^3) The f_{cap} was described in the PDD as the ratio of quantity of waste energy generated prior to the start of the project activity to the quantity of WECM (COG) used for energy generation. So f_{cap} is assumed to be 1 in ex-ante calculation of emission reductions, and can be adjusted in ex-post calculation according to the $Q_{WCM,y}$ in monitoring.		
2.5.6	How was the fraction of total electricity generated by the project activity using waste energy (f_{wcm}) verified?	/1/	DR	This fraction is 1 as no fossil fuels will be used on-site in the project and the heat energy is generated purely from use of waste oven gas.		OK
Baseline emissions (VVM para 89-93)						
2.5.7	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /8/	DR	The CO_2 emission factor calculation process and f_{wcm} are documented in a transparent manner and it is cross-checked by the published data from NDRC, AMS-III.Q and ACM0012.		OK
2.5.8	Have conservative assumptions been used when calculating the baseline emissions?	/1/ /42/	DR	According to the design data: $f_{cap} = \frac{Q_{WCM,BL}}{Q_{WAM,y}}$ The radio is 1 if the quantity of actual output/intermediate energy during year y is same or less than that theoretically produced ($Q_{WCM,BL}$). All the used assumptions are in line with the "Tool to calculate the emission factor for an electricity system" version 2 and Guidance for		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				request for deviation titled "*Application of AM0005 and AMS-I.D in China*" from EB.		
2.5.9	Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	N/A		OK
	Project emissions (VVM para 89-93)					
2.5.10	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Further clarification is sought on the emissions due to consumption of electricity by the project activity.	~~CL 8~~	OK
2.5.11	Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Further clarification is sought on the emissions due to consumption of electricity by the project activity.	~~CL 8~~	OK
2.5.12	Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Further clarification is sought on the emissions due to consumption of electricity by the project activity.	~~CL 8~~	OK
	Leakage (VVM para 89-93)					
2.5.13	Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	N/A		OK
2.5.14	Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	N/A		OK
2.5.15	Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	N/A		OK
	Emission Reductions (VVM para 89-93)					
2.5.16	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	/1/	DR CC	The calculation used to determine emission reductions was verified to be based on the most recent data available at the stage of validation, and also cross-checked to be consistent with the figures issued by NDRC of China.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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.					
Monitoring plan (VVM para 122-124)					
Data and parameters monitored					
2.6.1 Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/ /40/	DR	The proposed project activity applies the monitoring methodology described in the approved methodology AMS-III.Q version 03 /40/. 1. It needs to be clarified whether other fossil fuels will be co-fired in the WHRB in case of shortage of COG? 2. In case of project downtime (during schedule maintenance) it is needed to monitor the consumption of grid electricity to calculate the project emissions.	~~CL 9~~	OK
2.6.2 Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/ /40/	DR I	Yes. The monitoring plan contains all necessary parameters and clearly described in the PDD.		OK
2.6.3 In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR I	The flow of waste oven gas (COG) is monitored by flow meter.		OK
2.6.4 In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR I	The flow meters are in line with the standard of *Gas Flux Measurement in Closed Pipes –Turbine Flow Meter* (GB/T 18940-2003).		OK
2.6.5 In case parameters are measured, are the requirements for	/1/	DR	The flow meters are in line with the standard of		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.		I	*Gas Flux Measurement in Closed Pipes –Turbine Flow Meter* (GB/T 18940-2003). The regular calibration and management of barometers and thermometers will accord to the National standards and regulations.		
2.6.6	Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR I	Yes. The readings of flow meter will be continuously measured.		OK
2.6.7	Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR I	The readings of flow meter will be at least monthly recorded.		OK
	Ability of project participants to implement monitoring plan					
2.6.8	How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/ /40/	DR I	Yes. The monitoring plan is in line with the Methodology AMS-III.Q version 03.		OK
2.6.9	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/ /40/	DR I	Yes. The authority and responsibility of project management is described in the PDD.		OK
2.6.10	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/ /40/	DR I	Yes. QA/QC procedures are included in monitoring plan.		OK
2.6.11	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/ /40/	DR I	The archived electronic data will be kept until 2 years after the end of the total crediting period.		OK
	Monitoring of sustainable development indicators/ environmental impacts					
2.6.12	Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/ /40/	DR I	Monitoring of sustainable development indicators are not required by the Chinese DNA.		OK
2.6.13	Does the monitoring plan provide for the collection and	/1/	DR	Chinese DNA does not require collection and		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	archiving of relevant data concerning environmental, social and economic impacts?	/40/	I	archiving of data related to environmental, social and economic impacts. The environmental impacts will be monitored by local environmental authority.		
2.6.14	Are the sustainable development indicators in line with stated national priorities in the host country?	/1/ /40/	DR I	Monitoring of sustainable development indicators are not required by the Chinese DNA.		OK
	Duration of the project activity / crediting period					
3.0.1	**Start date of project activity (VVM para 99-100, 104)**					
3.0.2	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/ /10/	DR I	The starting date was on 3 November 2008 when equipment purchase contract was signed.		OK
3.0.3	Is the stated expected operational lifetime of the project activity reasonable?	/1/ /2/	DR	The operational lifetime of the project needs to be clearly stated in the PDD.	~~CL 10~~	OK
3.0.4	Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR	A fixed crediting period with length of 10 years is chosen for Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd. /1/. It stated in the PDD, version 03, dated 8 October 2010 that the crediting starting date is chosen as 01 April 2011 /1/.		OK
	Environmental Impacts (VVM para 131-133)					
4.0.1	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/ /5/	DR I	Yes. The EIA of Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd. was completed by Loudi Environmental Protection Research Institute in February 2008 /5/. The EIA of Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Industrial Co. Ltd was approved by Hunan Environmental Protection Bureau on 5 may 2008 /5/. There is no special condition that needs monitoring according to the EIA and the approval of EIA for the proposed project /5/.		
4.0.2	Does the project comply with environmental legislation in the host country?	/1/ /5/	DR I	Yes. The EIA of Waste Coke Oven Gas Recovery and Reconstruction of kilns in Loudi WUJO Industrial Co. Ltd. was approved by Hunan Environmental Protection Bureau on 5 may 2008 /5/.		OK
4.0.3	Will the project create any adverse environmental effects?	/1/ /5/	DR I	The project will have no significant impacts on the local environment according to the EIA /5/.		OK
4.0.4	Have identified environmental impacts been addressed in the project design?	/1/ /5/	DR	Yes. It clearly states the environmental impacts in the PDD, which covers air impact, waste water, solid waste, and impact of land disturb.		OK
	Stakeholder Comments (VVM para 128-130)					
5.0.1	Have relevant stakeholders been consulted?	/1/ /15/	DR I	Yes. The project owner carried out a public survey on the proposed project by questionnaires. 50 questionnaires were distributed and 50 of the distributed questionnaires had been returned/15/. The local residents, authorities and employees in the area were included in this survey.		OK
5.0.2	Have appropriate media been used to invite comments by local stakeholders?	/1/ /15/	DR I	The meeting was arranged to invite comments by local stakeholders on 8 January 2009, and the questionnaires were distributed to the local stakeholders.		OK
5.0.3	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	/1/ /5/	DR	Yes. The stakeholder consultation process is in accordance with Chinese EIA regulations.		OK

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

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	such regulations/laws?					
5.0.4	Is a summary of the stakeholder comments received provided?	/1/ /15/	DR I	Yes. The 50 copies of questionnaires were provided /15/, which were verified by DNV to be consistent with the summary in the PDD.		OK
5.0.5	Has due account been taken of any stakeholder comments received?	/1/ /15/	DR	No negative comments were received from the stakeholder representatives.		OK

Table 3 Resolution of corrective action requests and clarification requests

<table>
<tr><th>Corrective action and/ or clarification requests</th><th>Reference to Table 2</th><th>Response by project participants</th><th>Validation conclusion</th></tr>
<tr>
<td>CAR 1
PDD does not use the ;attest version of the methodology AMS-III.Q version 4.0

The corrective actions are requested on the project's compliance with the applicability criteria of the applied methodology as follows:
• For determining the time periods for which the emission reduction credits can be claimed, the remaining lifetime of equipments currently being used is requested to be demonstrated and compared with the crediting period.
• The waste coke oven gas utilization status in the absence of the project activity needs to be proven by one of the designated options provided in the applied methodology.

20 Feb 2012:
PP is requested to provide operational lifetime of all main equipments as detailed in Table A.3 (after implementation of the Project). The</td>
<td>B.2.6
B.2.7
B.2.8</td>
<td>The project has been updated to apply the new AMS-IIIQ (version 4.0) methodology.
1. The crediting period is 10 years. The remaining lifetime of all equipments currently being used is more than 10 years. The Year installed, Technical lifetime and the remaining lifetime of all the equipments can be found in "Lifetime proof for main equipment". This proof was issued by Hunan Province Loudi City Quality & technical inspection Bureau on 1st Nov 2009. Option (a) of the "Tool to determine the remaining lifetime of equipment", detailed in EB 50, Annex 15, has been used to define the remaining lifetime of project equipment. The difference between the Technical Lifetime and Operation Time has been used to calculate the Remaining Lifetime of all main equipment:

<table>
<tr><th>Equipment Name</th><th>Technical lifetime</th><th>Year Installed</th><th>Remaining lifetime (y)</th></tr>
<tr><td>ϕ2400 water coal-gas furnace</td><td>20</td><td>2005</td><td>13</td></tr>
<tr><td>GC-3 mixed coal gas furnace</td><td>20</td><td>2005</td><td>13</td></tr>
<tr><td>45 m2 glass furnace</td><td>25</td><td>2000</td><td>13</td></tr>
<tr><td>56 m2 glass furnace</td><td>25</td><td>2001</td><td>14</td></tr>
<tr><td>6 ton coal burnt boiler (SHF x 6-1.25-LIZ)</td><td>25</td><td>2000</td><td>13</td></tr>
<tr><td>4kW/5.5kW Lehre</td><td>24</td><td>2000</td><td>16</td></tr>
<tr><td>Processing Line</td><td>20</td><td>2004</td><td>12</td></tr>
<tr><td>Enamel converter</td><td>20</td><td>2004</td><td>12</td></tr>
<tr><td>COG compressor</td><td>15</td><td>2009</td><td>12</td></tr>
</table>
</td>
<td>The PDD version 05, dated 20 March 2012 has adopted AMS-III.Q (version 4.0) methodology.

PP has stated that Lianyuan HUIYUAN Coking Co., Ltd and Loudi WUJO Industrial Co., Ltd. are part of integrated industrial facility and whether Lianyuan HUIYUAN Coking Co., Ltd is also included in the project boundary, which has been evidenced from revised PDD dated 17 February 2012, version 4.

PP has provided</td>
</tr>
</table>

equipment's lifetime as listed in the document 'main equipment's lifetime proof' received from PP does not match with equipment details as listed in Table 1.3 of revised version of the PDD dated 17 Feb 2012, version 4. Substantiation the applicability condition 5 h (iv) is missing in the PDD dated 17 Feb 2012; version 4. PP requires to provide evidenced of modification details (replacement of main equipments and whether additional modification has been performed) of the plant.		6 ton COG burnt boiler (SZL6-1.25-WIIAI) | 20 | 2009 | 17 20,000m^3 COG burnt cabinet | 20 | 2009 | 17 2. According to the methodology, there are 4 options to prove the COG status in the absence of the project activity: (i) direct measurement, ii) energy balance, iii) energy bills or (iv) process plant manufacturers original specifications. In the project, Option (iv) is selected to demonstrate the COG status in the absence of the project activity. Direct measurement of COG released was not made prior to the project's implementation, and there is no evidence in the form of Energy bills as the waste gas was released to the atmosphere. Similarly, a historical energy balance is not available for the separate facility generating the waste gas used in the project. Therefore, the manufacturer's original specification/information, schemes and diagrams from the construction of the facility are used to estimate the quantity and energy content of waste gas/heat produced at the plant and to calculate the capacity/per unit of product produced. Please refer to Table B.1 in the PDD and also the footnote 1 in Section A.2 that gives further details. In absence of the project (baseline), the COG was released into the atmosphere after incineration. The kilns and furnaces use coal gas as the fuel to generate thermal energy with 3 sets of water coal gas furnace and 3 sets of mixed coal gas furnace. According to *'the main equipments technical specifications'* (issued by: Loudi WUJO Industrial Co., Ltd. (PP) on 1st Mar 2009), there are in total two coke ovens in the Huiyuan coking plant, the COG production capacity of each coke oven is 175,000,000 Nm^3, COG production capacity of the two coke ovens is 350,000,000 Nm^3. Additionally, the document specifies that the coke oven gas in the baseline scenario was released into the atmosphere after incineration (See the Coke oven technical parameter table). Please see the revised section A.2 of the PDD.	explanation that there has been not additional modification except replacing two coke ovens. This is evidenced from the 'The main equipments technical specification' issued by Loudi WUJO Industrial Co. ltd. The CAR 1 is closed.

		Project Boundaries: With regard to the project boundaries, Lianyuan HUIYUAN Coking Co., Ltd and Loudi WUJO Industrial Co., Ltd. are all part of integrated industrial facility, which all belong to the Wujo Light Industry & Chemicals Group. So Lianyuan HUIYUAN Coking Co., Ltd is also included in the project boundary. Modification of the plant: An explanation of the reconstruction to take place with the project activity is given in part (c) of Section A.2 in the PDD. Furthermore, it can be seen that the production capacity is not changed by the implementation of the project activity. '*the main equipments technical specifications'* issued by Loudi Wujo Industrial Co. Ltd. on the 1/3/2009 demonstrates the specifications of the main equipment before and after the implementation of the project activity. Existing coal gas boilers will be decommissioned and are not in use after the upgrade, the COG compressor will be installed to provide COG as a fuel to other equipment in the factory. The '*Kiln construction contract'* issued by Lianyuan City Huiyuan Gas Co., Ltd. in November 2008 details exactly what the project entails. The existing coal gas boilers will be demolished and replaced with a COG compressor, the glass smelters, processing lines and Lehres will all be retrofitted to run form COG. Furthermore, the FSR also gives a description of the steps involved in the retrofit project. In the Section 6.3 (p. 42-45) of the FSR, there is a detailed description of what exactly constitutes the retrofit. Also, note that after retrofitting, all the equipment producing coal gas are no longer used and have been removed from the project site. No additional production capacity has been added; only a retrofit has been conducted to allow the existing production equipment to run from COG rather than coal gas.	
CAR 2 In Chinese LoA, the project	B.5.6 B.5.7	The PP's name was incorrectly inputted as "Lengshuijiang Steel & Iron Co., Ltd" in the notification to UNFCCC.	The correct name of the PP is 'Loudi

<table>
<tr>
<td>participant's name is
Loudi WUJIANG Industrial Co., Ltd. in Chinese LOA', whereas in notification to UNFCCC, the pp name is Lengshuijiang Steel & Iron Co., Ltd.
Project participant's name does not match and identical in Chines LoA, notification to UNFCCC.

20 Feb 2012:
PP is to show whether UNFCCC has been requested the correct name.
PP as per PDD version 4, appears 'Loudi WUJO Industrial Co., Ltd'

PP is to clarify whether
Loudi WUJIANG Industrial Co., Ltd" is the correct PP name.
.</td>
<td></td>
<td>In Chinese Pinyin, the PP's name may be spelt "Loudi WUJING Industrial Co., Ltd.". In English, this is written as "Loudi WUJO Industrial Co., Ltd.". The Chinese LoA and UK LoA both appear with the company's English name.

The project participant's name in the FSR, EIA, UK LoA, Chinese LOA, the FSR & EIA approval is: Loudi WUJO Industrial Co., Ltd.

<table>
<tr><th>Evidence</th><th>Date</th></tr>
<tr><td>FSR</td><td>Feb. 1, 2008</td></tr>
<tr><td>EIA</td><td>Feb. 30, 2008</td></tr>
<tr><td>FSR approval</td><td>May. 7, 2008</td></tr>
<tr><td>EIA approval</td><td>May. 5, 2008</td></tr>
<tr><td>UK LoA</td><td>16 September, 2010</td></tr>
<tr><td>Chinese LOA</td><td>May, 2010</td></tr>
<tr><td>PDD</td><td>Oct 11，2011（Version 5）</td></tr>
</table>

Table B.3 in the PDD has been updated with the specific dates supplied above. Also, the ER spreadsheet and Tables A.5 and B.8 have had the start of the crediting period of the project updated to 1/02/2012.

Regarding the UNFCC notification:
PP has sent a request to the UNFCCC to have the correct name updated on the website, however they have not received any response from UN so far.

Annex 46 "GUIDANCE ON THE DEMONSTRATION AND ASSESSMENT OF PRIOR CONSIDERATION OF THE CDM" issued on the 2nd August 2008 (EB 41 meeting), states:
"The Board decided that for project activities with a starting date on or after 2nd August 2008, the project participant must inform a Host Party DNA <u>and/or</u> the UNFCCC secretariat in writing of the</td>
<td>WUIJANG Industrial Co. Ltd' and has been appeared in Chinese LoA, FSR, EIA, EIA Approval.

It is evidenced that Annex 46 is applicable for the project activity, which require PP to notify Host Party DNA and/or UNFCCC. Secretariat in writing of the commencement of the project activity and of their intention to seek CDM status.

Additionally PP has justified that the name appears on Chinese LoA reflects correct PP names.

The CAR 2 is closed.</td>
</tr>
</table>

commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months…"

However, this was since revised in Annex 61 "REVISION OF GUIDELINES ON THE DEMONSTRATION AND ASSESSMENT OF PRIOR CONSIDERATION OF THE CDM" issued on the 17th July 2009 (EB 48 meeting), which states:

*"The Board decided that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA **and** the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months…"*

In the case of the proposed project, it can be seen that Annex 46 was the applicable guidance at the time of project commencement, as seen in the table below.

Date	Key Event	Evidence
18th Apr. 2008	Board made decision to develop the project into CDM.	Resolution of Board of Directors
7th May 2008	Completed FSR and received the approval of Hunan committee of Economic.	FSR approval
3rd Nov. 2008	Starting time of the proposed project	Equipment purchase/reconstruction contract signed.
27 Apr. 2009	Notification of CDM intent approval achieved from DNA of China	CDM Notification form
Oct. 2009	Signed ERPA with CERs purchaser.	ERPA
16th Nov.	Prior consideration of CDM was confirmed by UNFCCC Secretariat	UNFCCC website

		2009		
		1st Apr. 2010	It is expected to be put into operation	Building program
		May, 2010	NDRC Letter of Approval received	NDRC LoA
		16th Sept. 2010	UK Letter of Approval received	UK LoA

The project start date is **3rd Nov 2008.** The CDM notification to the Chinese DNA was made in **April 2009** (within 6 months of the commence of the project)

The EB 61 revision was published on the 17th July 2009 (over 6 months after the commencement of the project) and the CDM prior consideration notification was made to the EB on 16th Nov 2009 (however EB was confused the names of the PP since the consultant submitted 3 different projects at the same time).

Based on the information above, PP would like to know if they can deleted the row of "Prior consideration of CDM was confirmed by UNFCCC Secretariat" from the Table B.3 in the PDD as they complied with EB 41 Annex 46, which was the relevant guideline at the time.

Regarding the correct name of PP:
The Chinese Pinyin name of the PO is Loudi Wujiang Industrial CO., Ltd. However, when translated to English, the PO uses the English name 'Wujo'. To prevent further confusion, the name of the project and the PO was changed to 'Wujo' for consistency.

Therefore, the project name is finalised as 'Waste Coke Oven Gas Recovery and Reconstruction of Kilns in Loudi WUJO Industrial Co., Ltd.' and the PP is called 'Loudi WUJO Industrial Co., Ltd'.

		The PDD (version 5) only uses WUJO in the PP's name. Additionally, 'Loudi WUJO Industrial Co., Ltd' appears on Chinese and UK LoA's.	
CL-1 The project participant requires demonstrating the baseline alternative scenarios in the PDD as per the methodology AMS-III.Q ver 03 (revised methodology AMS-III.Q version 4). 20 Feb 2012: PP requires to explain emissions from incineration of COG consideration in baseline. PP requires describing use of coal gas after implementation of the project activity e.g. use of coke oven gas as a source of thermal energy. PP requires describing remaining COG gas produced from Lianyuan HUIYUAN Coking Co., Ltd as only one-fifth of the total COG produced will be utilized in the project activity. PP requires to clarify emissions from transport of COG via 27 km long pipeline.	B.4.1 B.4.2 B.4.4 B.4.5 B.4.6 B.4.7 B.4.8	1.Baseline emissions: A. In the situation where the electricity is obtained from a specific existing power plant or from the grid, mechanical energy is obtained by electric motors and heat from a fossil fuel based element process (e.g. steam boiler, hot water generator, hot air generator, hot oil generator), (a) Baseline emissions from electricity (BE elec y) generated by waste energy (b) Baseline emissions from electricity (BE Elec y) to provide mechanical energy (c) Baseline emissions to provide thermal energy generated by waste energy B. In the situation where the recipient plant(s) obtains electricity (and electrical motor driven mechanical energy) and/or heat generated including steam, hot air, hot oil or hot water, etc. (and the steam generated to drive a steam turbine to supply mechanical energy) by a fossil fuel based existing cogeneration plant In absence of the proposed project, the COG will be released into the atmosphere after incineration. The kilns and furnaces use coal gas as the fuel to generate thermal energy with 3 sets of water coal gas furnace and 3 sets of mixed coal gas furnace. No electricity and no mechanical energy will be generated and no cogeneration plant exists in this project. Therefore, (a) and (c) are not possible baseline scenarios for this project. Option (b) is selected as the baseline scenario. The emissions from incineration in the baseline have not been considered the calculation of emissions reductions due to the lack of historical data regarding the volume and concentration of COG. No supporting fuel is needed for the incineration of coke oven gas. By not considering the emissions from the incineration of gas, the baseline emissions are understated. This follows the principle of conservativeness, and creates a corresponding reduction in the claimed Emissions Reductions of the project. 2. Project emissions:	PP has described the baseline of project activity as 'in the absence of the proposed project, the coke oven gas produced by two coke ovens were released to atmosphere after incineration'. The emission from incineration in the baseline scenario has not been considered. This is due to lack of historical data as well as no supporting fuel is needed for the incineration of coke oven gas. No coal gas is produced after implementation of the project activity. The remaining coke oven gas will

		The kilns and furnaces need to be reconstructed in order to switch from coal gas to COG utilisation. 3 sets of water coal gas furnaces and 3 sets of mixed coal gas furnaces will be removed. COG recovery from HUIYUAN will be utilized as the fuel for these kilns. When the project is implemented, coal gas is no longer produced. The original coal gas equipment has been removed, so the usage of coal gas no longer occurs after retrofitting. Neither the PP nor Lianyuan Huiyuan Coking Co., Ltd. have found any other suitable ways of utilizing the remaining 278,000,000Nm^3 of COG produced. Therefore, it is released into the atmosphere after incineration. The emissions from doing so are negligible, and are excluded from the baseline and project emissions calculations. The COG consumed by the project activity is transported to the project site by an enclosed pipeline, not by transport vehicles. Therefore there are no direct emissions involved in its transportation. According to methodology, there is guidance or consideration made in project emissions or leakage emissions for emissions from waste energy transport. Therefore, any emissions from the pipeline are not included in the emissions reduction calculation. Please see the revised section B.4 of the PDD.	be released to atmosphere as there is no fruitful usage. The coke oven gas is transported via a pipeline which does not have any leakage. The CL 1 is closed.
CL-2 Project participant requires demonstrating not adopting investment comparison analysis in the PDD.	B.5.13 B.5.25	Investment comparison analysis requires comparing the IRR in different investment conditions. In PDD, the baseline condition of the project is providing energy by coal gas, and the proposed project is to recover COG to replace the existing usage of coal gas. There is only 1 investment condition; therefore there is no comparison of different investment conditions in the project. So, the benchmark analysis (Option III) is suitable for this project. Loudi WUJO Industrial Co., Ltd is a branch of Hunan Wujo Light Industry & Chemicals Group Co. LTD. The main products of the PP are vacuum flask and ceramic products.	PP has described that the Loudi WUJO Industrial Co., Ltd is a branch of Hunan Wujo Light Industry & Chemicals Group Co.LTD. The main

Therefore, the project will adopt the benchmark of the glass manufacturing industry for comparison in the IRR calculation.

Please see the revised "1. Investment barriers" under B.5 on page 20 of PDD

Chapter 11 of the FSR has been translated as requested and it, along with the documents in the following table, will be used as evidence for the PDD and IRR spreadsheet:

Name	Issued by	Date
2005 Coal gas statistics	Loudi WUJO Industrial Co., Ltd	Dec.31, 2005
2006 Coal gas statistics	Loudi WUJO Industrial Co., Ltd	Dec.31, 2006
2007 Coal gas statistics	Loudi WUJO Industrial Co., Ltd	Dec.31, 2007
COG supplying pipe construction contract	Loudi WUJO Industrial Co., Ltd and Lian yuan Huiyuan coking Ltd	Dec. 1, 2008
Kiln reconstruction contract	Loudi WUJO Industrial Co., Ltd and Lian yuan Huiyuan coking Ltd	Nov. 3, 2008
COG supplying agreement	Loudi WUJO Industrial Co., Ltd and Lian yuan Huiyuan coking Ltd	Dec. 8, 2008
Coal invoice	Loudi WUJO Industrial Co., Ltd and Lianyuan Meijiang coal mining Ltd	July 30, 2008
Translation of chapter	Zhongji international	Feb. 2008

products of Loudi WUJO Industrial Co., Ltd are vacuum flask and Frying Pans. Therefore, Loudi WUJO is considered a light industry plant. Therefore the light industry IRR (13%) is suitable as the investment benchmark.

The CL 2 is closed.

<table>
<tr>
<td></td>
<td></td>
<td>
<table>
<tr><td>11 of FSR</td><td>engineering Design Institute</td><td></td></tr>
</table>

Table B.4 and IRR Sheet Basic Parameter page has been revised and match each other.
NCV was a typing error, it has been revised as NPV (net present value).
</td>
<td></td>
</tr>
<tr>
<td>CL-3
It needs to clarify the suitability of PLF (only heat) in financial analysis.</td>
<td>B.5.20
B.5.25</td>
<td>1. In order to reduce environmental pollution and reduce energy consumption, the glass furnaces, Lehres, processing lines, boilers and enamel converters have been reconstructed to use COG to replace coal gas. The reconstruction of the kilns includes reconstruction of key equipment, reconstruction of fuel injecting equipment and combustion system reconstruction. After reconstruction, the heat supply effect of the kilns has been improved.

2. In ‘the main equipments technical specifications’, ‘kiln testing report’ and FSR, the value of the PLF (heat efficiency) are all consistent; therefore the PLF adopted is suitable.

3. The ER calculation uses the PLF (heat efficiency) this is reasonable. In the post-ER calculation the PLF must be adjusted according to the actual data collected.

<table>
<tr><td>Kiln name</td><td>Baseline Efficiency</td><td>Project Efficiency</td></tr>
<tr><td>Glass furnaces</td><td>0.89</td><td>0.93</td></tr>
<tr><td>Processing line</td><td>0.82</td><td>0.82</td></tr>
<tr><td>Boiler</td><td>0.89</td><td>0.92</td></tr>
<tr><td>Lehres</td><td>0.88</td><td>0.94</td></tr>
<tr><td>Enamel converter</td><td>0.82</td><td>0.82</td></tr>
</table>

Please see the attached document: “main equipments technical specifications” issued by the PP on 1st Mar. 2009

Please see the attached document: “kiln testing report” issued by both Changsha City Energy Usage Monitoring Station and Hunan Province Quality and Technical Inspection Bureau on 06th Dec 2010.
</td>
<td>Efficiency of all main equipment is sourced from FSR, which has been cross checked with the ‘Main equipment technical specifications’, and ER calculation worksheet.

The CL 3 is closed.</td>
</tr>
</table>

		Please see the revised table B.7 which has been updated in the PDD.	
CL-4 At the time of the investment decision the coal gas tariff used (RMB 0.20/Nm^3). Further clarification is requested on this coal gas tariff (RMB 0.20/Nm^3). PP requires to provide reference document to substantiate coal gas price. This calculation of the coal gas tariff requires to be demonstrated in the PDD/IRR calculation spreadsheet. Amount of coal gas use requires to be evidenced	B.5.21 B.5.25	According to the FSR (p.55), the assumed price of Coal gas is 0.17 RMB/m^3 (without VAT) or 0.2 RMB/m^3 (with VAT). As the PP purchases coal (in its solid form) and produces coal gas from this at the project site, no invoice is available. A description and verification of the costs that go into this process is given below. Please refer to *"Coal gas price evidence calculation"* issued by China Machinery International Engineering Design and Research Institute in May 2009. This is an independent research organization and has issued this document demonstrating how the coal gas price is calculated. The calculation is provided below: Additional evidences for the calculation of Coal gas Price: 1. Coal price: a. Please refer to the *"coal purchase invoice"* issued by Lianyuan City Meijiang Town FUXING Coal co. Ltd in Oct 2008 2. Salary: a. Please refer "*Salary evidence*" issued by Loudi City government Human resource & social security department on 1st June 2011: " the average salary in 2010 in Hunan Province is 29,280 RMB/year" 3. Water price: a. Please refer "*Loudi water price evidence*" issued by Hunan Provincial government Pricing bureau on 4th Nov 2002. The evidence shows that the water price for industrial usage is 1.32 RMB/ton. 4. Coal gas consumption quantity: a. Please refer to the *"coal and coal gas consumption record 2005-2007"* issued by PP According to FSR (p.55), the consumption of coal gas was 120,326,700m^3 per year. Also please refer to the Coal and coal gas consumption record 2005 -2007: o Annual consumption of coal gas in 2007 is: 121,266,614 m^3 o Annual consumption of coal gas in 2006 is: 120,326,700 m^3	PP has demonstrated coal gas price and all the cost parameters sources have been evidenced. Amount of coal use has been evidenced via coal and coal gas consumption record. The CL 4 is closed.

		o Annual consumption of coal gas in 2005 is: 122,142,559 m^3 *Actual Coal Gas cost calculation:* Unit Coal consumption quantity in coal gas production: 0.728 kg/m^3 Unit water consumption quantity in coal gas in coal gas production: 0.982 kg/m^3 Unit Coal price: 270 RMB/t Unit Water Price: 1.755 RMB/t Coal gas annual consumption: 120,326,700m^3 Unit cost of coal in coal gas production: 0.728 kg/m^3 * 270RMB/ton/1000 = 0.19656 RMB/m3 coal gas Unit cost of water in coal gas production: 0.982 * 1.755/1000 = 0.00172 RMB/m^3 Coal gas production cost: 120,326,700 m^3 * (0.19565 + 0.00172) RMB/m^3 = 23,858,300 RMB/year Staff cost: 10 staffs * 28,200/staff/year = 282,000 RMB Equipment repair and maintenances: 400,000 RMB/year Total cost: 23,858,300 + 282,000 + 400,000 = 24,540,300 RMB/year Therefore, unit cost of coal gas: 24,540,300 /120,326,700 m^3 = 0.2 RMB/m3	
CL-5 Clarification is requested with regard to suitability of investment cost in financial analysis with sufficient evidence of investment cost estimate.	B.5.22 B.5.25	The FSR (issued in May 2008) estimate of Total static investment (including the construction of the pipeline and the kiln reconstruction) was 48,293,000 RMB. As the project has commenced construction since this estimate was made, the actual construction contracts are available to evidence this investment. Please refer to the '*Pipe construction contract*' and the '*Kiln construction contract'* to prove the investment cost of the project.	PP has provided references for all investment parameters and has been checked by Financial Expert.

<table>
<tr>
<td>A discrepancy exists between the substantiated investment figure and the total investment figure used in the IRR calculation spreadsheet

PP requires to provide evidenced of all investment parameters, O&M costs (purchase order, payments etc.).

PP requires to explain:

1. Whether cost attributed to sale of COG has been considered in IRR
2. Whether savings from displacing of coal gas (amount of coal gas also requires to be evidenced) has been considered in IRR analysis.

Can it be explained why in the IRR spreadsheet a figure of 48,293,000 RMB was used instead of total investment of the project?

FSR date is February 1998 – is this the most recent document?</td>
<td></td>
<td>The ‘Pipe construction contact’ was issued by PP, Lianyuan City Huiyuan Gas Co. Ltd. (COG supplier) and Changsha Laodaohe Construction company (constructer) on 1st Dec 2008. In the contract, the unit construction cost is 1 million RMB/Kilometre, total 27 kilometres, among the total construction cost: 19 million RMB was born by PP, 8 million RMB was born by the COG supplier.

The ‘Kiln construction contract’ was issued by PP and Lianyuan City Huiyuan Gas Co. Ltd in Nov 2008. In the contract, the total construction cost is 29.5 million RMB.

<table>
<tr><th>Item</th><th>Amount (RMB)</th><th>Reference</th></tr>
<tr><td>Cost of pipe construction</td><td>19,000,000</td><td>Pipe construction contract</td></tr>
<tr><td>Cost of kiln reconstruction</td><td>29,500,000</td><td>Kiln reconstruction contract and Project construction Invoice</td></tr>
<tr><td>Total investment of the project</td><td>48,500,000</td><td>Actual Investment</td></tr>
</table>

Please also see the attached document: “project construction invoice” from the PP evidencing the payment of 29,500,000 RMB to Lianyuan City HUIYUAN Gas Company for the Kiln construction.

These documents show the actual investment in the project to be 48,500,000 RMB, slightly more than the FSR estimate. This shows the FSR and IRR calculation to be conservative.

Regarding the purchase of COG:
The cost of purchasing and transporting the COG from Huiyuan Gas Co. Ltd. to the project site is included in the IRR analysis. It is purchased at 0.17 RMB/m^3, see the ‘basic parameters’ sheet of the IRR spread sheet.</td>
<td>PP has explained that cost attributed of purchasing and transporting of COG has been considered in IRR analysis.

PP has clarified that actual investment cost was 48 500 000 RMB and have used in IRR, which is conservative,

PP has clarified that the FSR date is April 2008.

The CL 5 is closed.</td>
</tr>
</table>

		The savings from the displacement of coal gas is the only revenue of the project. These savings have been considered in the IRR analysis (see the 'profit' sheet). Refer to the "*Coke Oven Gas supply agreement"* issued by PP and Lianyuan City Huiyuan Gas Co. Ltd. on 8th Dec 2008 for evidence. Total investment figure: The Total Investment figure of 48,293,000 RMB was the estimate made in the FSR. This estimate was used in the financial analysis of the project, as it was the best available information at the time of the investment decision. The FSR underpins the financial analysis of the project and should be used to calculate the projects IRR. Since then, the project has begun construction and actual evidence of the actual invoiced amounts can be provided. Please refer to the '*Pipe construction contract*' and the *'Kiln construction contract'* to prove the investment cost of the project. These documents show the actual investment in the project to be 48,500,000 RMB, slightly more than the FSR estimate. This shows the FSR and IRR calculation to be conservative. FSR Date: The PP has confirmed that the FSR provided to DNV is the most recent document and was finished in April 2008.	
CL-6 Clarification is requested with regard to O&M cost adopted in financial analysis PP requires to provide evidenced of all investment parameters, O&M costs. PP requires to explain:	B.5.23 B.5.25	The O&M costs are primarily comprised of the transport and maintenance costs for COG. The COG cost is not the COG cost itself, but the cost for collection and transportation of the COG from Huiyuan Gas Co. Ltd. to the project site. The FSR and the "*Coke Oven Gas supply agreement"* issued by PP and Lianyuan City Huiyuan Gas Co. Ltd. on 8th Dec 2008 can be used to evidence the COG O&M cost in the IRR calculation spread sheet. In the agreement, the costs born by PP include: 1. COG pipe purchase and transportation cost: 10.78 million RMB Where; COG price * COG Volume = 0.15 RMB/m^3 (no VAT) * 71,880,480m^3 = 10.78 million RMB. COG pipe maintenance cost: 2.92 million RMB/year. Therefore, the total Pipe	PP has provided references for all investment parameters and has been checked by FE. PP has explained that cost attributed of purchasing and transporting of

<table>
<tr>
<td>1. Whether cost attributed to sale/purchase of COG has been considered in IRR
2. Whether savings from displacing of coal gas (amount of coal gas also requires to be evidenced) has been considered in IRR analysis.

Incorrect currency abbreviation, parameters 1,2 & 3 not substantiated (it is not clear if these are already included into parameter 5 (which is used in the IRR calc) or not. Transparency and clarity is required.</td>
<td></td>
<td>operation cost is (10.78 + 2.92 million) 13.70 million RMB/year (FSR – p.55).

And inclusive of Other repair and insurance costs (560,500 RMB), total O/M cost is 14.26 million RMB/year (FSR – p.55).

Justification of O&M Costs:
As seen in the table below, the O&M costs are comprised of three factors, Repair Cost, Insurance and the Pipe operation cost (cost of purchase and transport of COG and Pipe operation and Maintenance). These are shown in the table below, further justification is given underneath.

<table>
<tr><th>Cost</th><th>Cost per year (10,000 RMB)</th><th>Reference</th></tr>
<tr><td>Repair cost</td><td>45.29</td><td>FSR (p.55)</td></tr>
<tr><td>Wage</td><td>0.00</td><td>n/a</td></tr>
<tr><td>Insurance</td><td>10.76</td><td>FSR (p.55)</td></tr>
<tr><td>Low value consumables</td><td>0.00</td><td>n/a</td></tr>
<tr><td>Pipe operation cost

The sum of:
COG Collection and Transport
Pipe Operation and Maintenance Costs</td><td>1370.0

1078.0

292.00</td><td>FSR (p.55)</td></tr>
<tr><td>Interest</td><td>0.00</td><td>n/a</td></tr>
<tr><td>Total O&M cost</td><td>1426.05</td><td>FSR (p.55)</td></tr>
</table>

Repair Rate and Insurance costs:
The Repair costs of the project are calculated as 1% of the construction investment per year. This is an extremely conservative choice of repair rate when considered with other projects using the same methodology. The table below gives the repair rate used in other recently registered projects using AMS-III.Q.</td>
<td>COG has been considered in IRR analysis.

PP has addressed incorrect currency abbreviation and justified all O&M costs.

The CL 6 is closed.</td>
</tr>
</table>

Project Number	Project Name	Repair Rate
5224	Zhonglian 4.5MW Waste Heat Power Generation Project in Hebei Province	4%
4208	Jiangxi Nanfang Cement Low Temperature Waste Heat Power Generation Project	1.5%
3564	Sichuan LiwanBusen Cement Waste Heat Recovery for Power Generation Project	4%
3832	Liaoning Chaoyang Waste Gas Recovery for Electricity Generation	2.5%
n/a	Proposed Project	1%

Additionally, it should be noted that the Repair cost and Insurance only contribute only 1% and 0.25% of total O&M costs. Even when both these costs are omitted from the financial analysis, the benchmark only reaches 7.33% is still beneath the industry benchmark of 13%.

Wages, Low value consumables and Management Costs:
As the project only involves a retrofit (to change the fuel source) of existing equipment, there is no need for additional employees or management resources following the implementation of the project activity. Therefore, these costs are given a value of 0. For the same reason, no cost is allocated to the purchase of low value consumables (i.e. staff safety gear, travel expense etc.). This is conservative.

Pipe Operation Cost:
The primary factor in the project's O&M cost is the COG transportation and pipeline maintenance. Purified COG is transported to the project site via a 27km pipeline. The transportation fee is 0.17 RMB/m3 (with VAT) or 0.15 RMB/m^3 (without VAT), this price is inclusive of the costs of purification.

Based on the FSR (p.56);

- Pipeline operation and maintenance cost: 2.92 million RMB/year
- COG collection and transportation cost (including purification): 10.78 million RMB/year

		Based on FSR (p.55): After retrofitting, the consumption volume of COG is: 71,880,480m^3 Based on the '*COG supply agreement'* (p.1), the COG cost is: 0.17 RMB/m3, or 0.17/1.17 = 0.15 RMB/m^3 (before VAT) Therefore, COG usage cost is: 0.15RMB/m3 * 71,880,480 = 10.78 million RMB/year Please also refer to the *'COG invoice 1'* & *'COG invoice 2'* as evidence of COG price being 0.15RMB/m^3 The PDD has been updated under Section B.5.	
CL-7 The variable rate for each parameter which will make the IRR exceed the benchmark should be calculated and the likelihood to happen should be substantiated. However, the final parameter, coal gas price, still needs to be justified in relation to the source and applicability of the data used to determine the price of coal gas.	B.5.26 B.5.28	A sensitivity analysis has been conducted and is fully detailed in the IRR and PDD. A table showing the variation of factors within a -10% and 10% range is given. Within this variation range none of the factors improve the IRR to reach the 13% benchmark. A brief summary of the critical points and justification is provided below. Total Investment: According to the official statistics issued by National Bureau of Statistics of China, the fixed investment price has increased 1.60%, 1.50% and 3.90% in 2005, 2006 and 2007[1,2,3], and the average annual increased rate is 2.33%, this trend will not change much in the future. Therefore, it is very impossible to decrease the total static investment to the threshold value of -27.98% (to make the IRR reach the benchmark) due to the price increasing of the raw material and wages and the difficulties of kiln reconstruction O&M Cost: According to the same above official statistics as above, the annual increase of raw	A sensitivity analysis has been performed with 4 parameters; viz. Total investment, O&M costs, coal gas volume (amount) and coal gas price. The choice of parameters is deemed acceptable in order to have a significant effect on the project.

[1] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20060227_402307796.htm
[2] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20070228_402387821.htm
[3] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20080228_402464933.htm

<table>
<tr>
<td></td>
<td></td>
<td>material, fuel and power costs is 5.9%; worker salary has increased 13.03% on average. Therefore, it is very impossible to decrease the O&M to the threshold value of -18.00%.

Coal Gas Amount:
The equipments production capacity will not change and the heat efficiency will also not change, as a result, total coal gas amount will not increase to 12.70%.

Coal Gas Price:
Loudi city is a main coal-mining zone in Hunan province and in China. So the coal price is comparatively low in china and is not likely to increase. Therefore, it is very impossible to increase the coal gas price to the threshold value of 12.70%.
The assumed price for coal gas has been estimated above in CL4.

Please check the revised “sensitivity analysis” on PDD and revised IRR sheet.</td>
<td>Sensitivity analysis .has been performed for coal gas price.

The CL 7 is closed.</td>
</tr>
<tr>
<td>CL-8
Further clarification is sought on the emissions due to consumption of electricity by the project activity.</td>
<td>B.6.10
B.6.11
B.6.12</td>
<td>According to the FSR, the furnaces and Kilns using the COG in place of coal gas will not increase the consumption of electricity.

WUJO project electricity consumption in baseline
<table>
<tr><th>ID</th><th>Baseline</th><th>After changing to COG</th></tr>
<tr><td>1</td><td>Coal breaker</td><td>Replaced</td></tr>
<tr><td>2</td><td>Coal blender</td><td>Replaced</td></tr>
<tr><td>3</td><td>Coal extruder</td><td>Replaced</td></tr>
<tr><td>4</td><td>Air blower</td><td>No change</td></tr>
<tr><td>5</td><td>Pump</td><td>No change</td></tr>
<tr><td>6</td><td>Charging machine</td><td>No change</td></tr>
<tr><td>Electricity consumption</td><td>100,000 KWh</td><td></td></tr>
</table>
</td>
<td>PP has described that there is no additional requirement of electricity after implementation of the project activity.

Electricity consumption by air blower, pump, charging machine remains same in baseline scenario and project scenario. Hence no change in electricity</td>
</tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td>WUJO project electricity consumption in project scenario
<table>
<tr><th>ID</th><th>project scenario</th><th>After changing to COG</th></tr>
<tr><td>1</td><td>Gas pressure regulator (calculate) instrument</td><td>Added to the system</td></tr>
<tr><td>2</td><td>Gas Safety Monitoring and Controlling System</td><td>Added to the system</td></tr>
<tr><td>3</td><td>20000 M^3 wet gas cabinet</td><td>Added to the system</td></tr>
<tr><td>4</td><td>Air blower</td><td>No change</td></tr>
<tr><td>5</td><td>Pump</td><td>No change</td></tr>
<tr><td>6</td><td>Charging machine</td><td>No change</td></tr>
<tr><td>Electricity consumption</td><td>100,000 KWh</td><td></td></tr>
</table>
In baseline, for the production of coal gas, coal breaker, coal blender, and coal extruder are needed. In the project scenario, because the COG is used to replace coal gas, coal breaker, coal blender, and coal extruder are removed, at the same time COG gas pressure regulator (calculate) instrument, COG gas safety monitoring and controlling system, and wet gas cabinet are added for the transportation and proper use of COG. There is no change is total electricity consumption.</td>
<td>consumption

The CL 8 is closed.</td>
</tr>
<tr>
<td>CL-9
1. It needs to be clarified whether other fossil fuels will be co-fired in the WHR boiler in case of shortage of COG
2. In case of project downtime</td>
<td>B.7.1</td>
<td>1. The total COG production capacity of Huiyuan coke-oven plant is 350,00,000 m^3/year, the amount of COG used in this project is 71,880,000 m^3/year (see ‘Coke Oven Gas supply Agreement’), so, the COG supply is sufficient to satisfy the demand for COG from the project. No other fossil fuels will be co-fired.</td>
<td>PP has clarified that the consumption of waste COG (71.8 million Nm3) is less that the waste</td>
</tr>
</table>

(during schedule maintenance) it is needed to monitor the consumption of grid electricity to calculate the project emissions 22 Feb 2012: PP requires to provide relevant documents, such as production levels to prove that COG is less that the waste COG produced.		To evidence the total COG produced (approx. 350,000,000m^3 per year) by Lianyuan Huiyuan Coking Co., Ltd., refer to the document *'COG discharging explanation'* issued by Lianyuan Huiyuan Coking Co., Ltd. on 5th February 2008. The amount of COG consumed by the project is estimated to be 71.8 million m^3 in the FSR (p.16 – Table 9 of FSR). The *'Coke Oven Gas supply agreement'* also gives an expected figure for COG consumption of 71.8 million m^3. Please refer to the "*COG usage record*" issued by the PP. The total COG usage amount from July to Dec in 2010 was recorded as 52,134,205.5 m^3 and the total COG usage amount in 2011 was recorded as 74,956,478.0 m^3. This is significantly less than the total amount produced by Lianyuan Huiyuan Coking Co., Ltd. 2. There is a 20,000 m^3 COG gas cabinet that can store and adjust the supply of COG. In case of project downtime, consumption of grid electricity is not required and the COG gas in the gas cabinet is a timely energy supplement source. It is not necessary to monitor the consumption of grid electricity.	COG produced (350 million Nm3) The consumption of COG is evidenced from FSR and is cross-checked with COG supply agreement. The production of COG is sourced from COG discharging explanation. In order to prove sufficiency of COG production and no other fossil fuel will be co-fired, production records of COG shall be evidenced. The gas cabinet with capacity of 20,000 Nm3 will facilitate the thermal energy need in case of a downtown of COG production and supply. The capacity of gas cabinet is in

			accordance of FSR. PP has substantiated that COG production less that waste COG. The CL 9 is closed.
CL-10 The operational lifetime of the project needs to be clearly stated in the PDD. PP is requested to provide operational lifetime of all main equipments as detailed in Table A.3 (after implementation of the Project) as per EB 50/Annex 15, dated 16 October 2009. The equipment's lifetime as listed in the document 'main equipment's lifetime proof' received from PP does not match with equipment details as listed in Table 1.3 of revised version of the PDD dated 17 Feb 2012, version 4. PP requires to provide details of each of the equipment life time calculation (schematic diagram).	C.1.3	According to the *"main equipment's lifetime proof"* issued by Hunan Province Loudi City Quality & Technical Inspection Bureau on 1st Nov 2009, the operational life time of all the main equipments are more than 10 years, and the remaining lifetime of the equipments are also more than 10 years. The crediting period of the project 10 years is very suitable for the project. Please see the updated PDD. The following insertion has been made above Table A.2: Table A.3 and A.2 give the technical parameters of the main project equipment before and after the implementation of the project activity. *Option (a)* of the "Tool to determine the remaining lifetime of equipment", detailed in EB 50, Annex 15 (16th October 2009), has been used to define the remaining lifetime of project equipment. *Option (a)* uses the difference between the Technical Lifetime and Operation Time to calculate the Remaining Lifetime.	PP has provided operational lifetime of each of main equipment as per Tool to determine remaining lifetime of equipment. The CL 10 is closed.

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
N/A	N/A	N/A

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APPENDIX B

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

Chandrashekara Kumaraswamy

Kumaraswamy Chandrashekara holds a Bachelor's Degree in Chemical Engineering and has an overall experience of around 24 years. Prior to joining DNV, has worked for 11 years in the Chemical Process Industry covering Plant Operations, Technical Services and Process Design activities, primarily in the fertilisers and chemicals manufacturing sector. During this tenure of 11 years in the industry, responsibilities included production, process optimization, energy efficiency improvements, environmental performance, process design, energy auditing and technical auditing.

He has experience of around six years in the validation and verification of numerous CDM projects both in India and abroad. His qualification, industrial experience and experience in CDM sufficiently demonstrate his sectoral competence in the areas of chemical process industries, energy generation from renewable sources and waste handling & disposal.

Zhang Xiaojun, Johnsen

Xiaojun Zhang holds a Master Degree in Metallurgical Physical Chemistry and obtained his MBA in project management. Also he majored in Chemistry, which involves organic, inorganic, structure and analysis chemistry as bachelor degree. He has an overall experience of 26 years. Prior to joining DNV, Johnsen had an overall experience of 4 years in glass manufacturing industry covering production, energy efficiency improvement and commissioning. Later on he gained combined experience of more than 15 years in the iron and steel industry, while he worked as researcher and management personnel in Central Iron and Steel Institute, the sector covering the refractory, iron & steel, waste heat recovery, solid waste disposal, waste fuel treatment, waste energy efficiency and relevant environmental affairs. His experience also covers the fields of environmental management, resource conservation and cleaner production in various manufacturing and metallurgical industries. He has also gained the experience in Management System Audits such as ISO 9001, ISO 140001 standards in various industrial sectors for more than 3 years for industrial plants. For financial analysis and investment, he has gained the relevant knowledge through his MBA course; and through the feasibility case study in the iron and steel sector while he worked as management personnel, he gradually gained concerted experience in cost accounting, financial analysis and investment input parameter assessment.

He has experience of more than 3 years in validation and verification of numerous CDM projects in DNV in China.

His qualification, industrial and investment experience and experience in CDM demonstrate him sufficient sectoral competence in "Glass", "Iron and Steel" and "Energy Generation from Renewable Energy Sources".

Zhang Lei, Lucas

Lei Zhang holds a Bachelor Degree in Applied Chemistry. Prior to joining DNV, having four years and seven months experience in coal gasification industry covering the process of coke

production line and wastewater treatment. His experience also covers the fields of environmental management and environmental impact assessment.
He has experience of around half a year in validation and verification of CDM projects in DNV.
His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in "Waste Handling and Disposal".

Grant Stephen Little
Grant Little Holds a Bachelor Degree in Pure and Applied Chemistry; with a Secondary Degree in Forest Products Manufacture and a Master's Degree in Business Administration. He has over 20 years of industrial experience. Prior to joining DNV, Grant gained 16 years' experience in the forest products industry covering Process Engineering, energy projects, Sustainable Development, Forest eco-labelling and Environmental Management Systems. He also has over 5 years' experience in the carbon project development and carbon markets in Africa and the Middle East where he worked for a carbon aggregator and a government owned carbon management and environmental project Development Company. He is passionate about Africa and sees his work as a contribution to the development of the continent.

Noim Uddin
Noim Uddin holds PhD in Environmental Studies, Master of Science in Sustainable Energy Engineering and Bachelor of Science in Mechanical Engineering. Having an overall experience of around 12 years. Prior to joining DNV having 3 years experience in sustainable energy strategy development, 4 years experience on working biomass projects and 3 years on other renewables covering research, design and modelling, and experience in accreditation auditing under UNFCCC's CDM and JI schemes (DOEs and AIEs accreditation).

Noim has experience of around 3 years in validation and verification of several CDM/JI projects and third party verification under ISO 14064, ISO 14044, Renewable Energy Target and other voluntary greenhouse gas, and VCS.

Stanislav Dvořák
Stanislav Dvořák holds a Master of Science Degree from the Chemical University in Prague, Faculty of Chemistry and Technology of Fuels and Environment. He is having an overall working experience of around 40 years. Prior to co-operation with DNV he is having all 40 year experience in glass industry covering positions in research and development (e.g. glass melting furnaces transfer from coal, gas and oil to natural gas heating) and different managerial positions (director for research, commercial director, CEO). He is retired at present.

He has an experience in validation of one CDM project as a sector expert. His qualification and industrial experience demonstrate his sufficient sector competence in the area TA 4.11 Glass.

Jan Van Evercooren

Holds a PhD Degree in Chemistry. Having an overall experience of around 40 years. Prior to joining DNV having 4 years 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 years experience in environmental consulting in various technical areas covering set-up of air pollutant emission inventories, air pollutant emission & immission measuring, air pollution dispersion modeling 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 "Iron and Steel", "Metal production", "Coke" and "Waste handling and disposal".

Edwin Aalders

Mr Aalders has nearly 20 years of experience as an assessor in Environmental Auditing and accreditation and started his career in SGS in 1992 were he quickly became involved in the development of new environmental certification & control services. In 2004 he became the Director of the International Emission Trading Association (IETA) which he held till 2009. In addition to his role as Director in IETA he held between November 2007 and October 2008 the role of Acting CEO for the Voluntary Carbon Standard Association (VCSa). In 2009 Mr Aalders became a Partner with IDEAcarbon before joining DNV as Approver / Responsible Service Line - CDM at the Climate Change and Sustainable Development Department in 2011. Throughout his career he lived and worked throughout the developing and developed countries and been involved in developing new environmental markets. Mr Aalders is an elected member of roster of experts for the Methodology Expert of the CDM & JI, in sits on the AFOLU Steering Committee of the Verified Carbon Standard Association (VCSa) and Advisory Board of the Pacific Carbon Trust.