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# VALIDATION REPORT

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## SHANXI HONGYI GLASSWARE CO., LTD. SMALL-SCALE FUEL SWITCHING PROJECT IN CHINA

REPORT No. 2010-0127

REVISION No. 03

DET NORSKE VERITAS



## VALIDATION REPORT

Date of first issue: 2010-04-23	ConCert Project No.: PRJC-174287-2009-CCS-BEL	DNV CLIMATE CHANGE SERVICES AS
Recommended for approval by:  Chandrashekara Kumaraswamy	Approved by  Michael Lehmann	Organisational unit:  Climate Change and Environmental Services
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### Summary:

**Project Name:** Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project

**Country:** China

**Methodology:** AMS-III.B

**Version:** 14

**GHG reducing Measure/Technology:** Fuel switch

**Sectoral Scope:** 01

**ER estimate:** 45 251 tCO<sub>2</sub>e 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 "Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project" in China, as described in the PDD, version 04 of 14 September 2011, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology AMS-III.B, version 14. Hence, DNV requests the registration of the project as a CDM project activity. This report has been revised in response to the review requested by three members of CDM Executive Board.

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***Abbreviations***

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CL	Clarification request
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission Factor
EIA	Environmental Impact Assessment
ERPA	Emission Reductions Purchase Agreement
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of approval
NCV	Net calorific value
NDRC	National Development and Reform Commission
NG	Natural Gas
NGO	Non-governmental Organisation
NPV	Net Present Value
ODA	Official Development Assistance
PDD	Project Design Document
PP	Project Participant
RMB	Renminbi, Chinese currency (yuan)
SSC	Small Scale Project Activities
tCO <sub>2</sub> e	Tonnes of CO <sub>2</sub> 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 “Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project” 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 the 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 participants Shanxi Hongyi Glassware Co., Ltd. and Trading Emissions PLC. The DNA from China confirmed that the project assists in achieving sustainable development.*

*The project correctly applies the baseline and monitoring methodology AMS-III.B, version 14 “Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories-Type III.B. - Switching fossil fuels”.*

*The project activity involves the switch of fossil fuel from coal to the less carbon-intensive natural gas. As a result, the project results in reductions of CO<sub>2</sub> emissions which are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.*

*The total emission reductions from the project are estimated to be on the average 45 251 tCO<sub>2e</sub> per year over the first 7 years renewable 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 “Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project” in China, as described in the PDD of version 04 dated 14 September 2011, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology AMS-III.B, version 14. Hence, DNV requests the registration of the project as a CDM project activity.*

Bangalore and Oslo, 14 September 2011

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DNV Climate Change Services AS



## 2 INTRODUCTION

Trading Emissions PLC has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the “Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project” 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, the simplified modalities and procedures for small-scale CDM project activities and the subsequent decisions by the CDM Executive Board.

### 2.1 Objective

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

### 2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, the simplified modalities and procedures for small-scale CDM project activities and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AMS-III.B, version 14 (Sectoral Scope: 01). The validation was based on the recommendations in the Validation and Verification Manual /44/.

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/ Trading Emissions PLC: *CDM-PDD for project activity "Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project" in China*, version 2 dated 19 March 2009 version 3 dated 6 May 2011 and version 4 dated 14 September 2011
- /2/ Shanxi Guoyang Investment Consulting Co., Ltd.: *Feasibility Study Report of (FSR) for project activity "Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project" in China* dated June 2006 and approved by Shanxi Qi County Planning Commission, dated 16 August 2006.
- /3/ Shanxi Qi County Environmental Protection Agency: *EIA registration form for project activity "Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project" in China* ratified on 16 September 2006
- /4/ Trading Emissions PLC: *NPV analysis calculation spreadsheet for project activity "Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project" in China*, Version 02 dated 19 March 2009 and Version 3 dated 6 May 2011.
- /5/ Trading Emissions PLC: *ER calculation spreadsheet for project activity "Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project" in China*, Version 02 dated 19 March 2009 and Version 3 dated 6 May 2011.
- /6/ Zhangjiagang Dongfeng Special Blower-Fan Co., Ltd.: *Technical specification of blowers for the proposed project activity*, dated 1 April 2007.
- /7/ Shanxi Hongyi Glassware Co., Ltd. & Zhangjiagang Dongfeng Special Blower-Fan Co., Ltd.: *The purchase agreement of blower for the proposed project activity*, dated 3 April 2007.
- /8/ Shanxi Hongyi Glassware Co., Ltd.: *The Minutes of Board Meeting to decide the CDM development*, dated 10 October 2006.
- /9/ Shanxi Hongyi Glassware Co., Ltd. and China Jingye Engineering Co., Ltd.: *Engineering procurement and construction contract for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project*, dated 10 February 2007.
- /10/ Shanxi Hongyi Glassware Co., Ltd. and Shanxi Taiyuan Zihuan Environmental Protection Technology Ltd.: *CDM Consulting Contract for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project*, dated 23 June 2007.
- /11/ *Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project, CDM-related*



- training records, dated 10 September 2007 and 7 December 2007.*
- /12/ Shanxi Hongyi Glassware Co., Ltd. and Qixian Haoyuan Natural Gas Co., Ltd.: *The natural gas supply intention for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project, dated 2 May 2006.*
- /13/ Shanxi Hongyi Glassware Co., Ltd. and Qi county Jieyuan Natural Gas Co., Ltd.: *Natural Gas Supply Agreement for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project, dated 17 January 2008.*
- /14/ Qi county Jieyuan Natural Gas Co., Ltd.: *Invoices of natural gas supplied to Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project (including the natural gas price of 2.03 RMB/Nm<sup>3</sup>), dated 18 November 2008.*
- /15/ Qi county Jieyuan Natural Gas Co., Ltd.: *Invoices of natural gas supplied to Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project (including the natural gas price of 2.12 RMB/Nm<sup>3</sup>), dated 16 December 2009.*
- /16/ Qi county Jieyuan Natural Gas Co., Ltd.: *Invoices of natural gas supplied to Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project (including the natural gas price of 2.42 RMB/Nm<sup>3</sup>), dated 25 December 2010.*
- /17/ Bureau of commodity prices of Jinzhong City in Shanxi Province: *Notice on the price of natural gas in the Jinzhong City, dated 24 February 2009.*
- /18/ Jie Xiu City Xiaoweigou Coal Supply Co., Ltd.: *Invoice of coal purchased by the Shanxi Hongyi Glassware Co., Ltd., dated 10 January 2007.*
- /19/ Jie Xiu City Xiaoweigou Coal Supply Co., Ltd.: *Proof to demonstrate the coal price in Shanxi province, dated 26 October 2010.*
- /20/ Shanxi Hongyi Glassware Co., Ltd. and Trading Emissions PLC: *CDM Emission Reductions Purchase Agreement (ERPA) for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project, dated 3 October 2008.*
- /21/ Shanxi Hongyi Glassware Co., Ltd.: *Monitoring training scheme and records, dated September 2007.*
- /22/ Shanxi Qi County Planning Commission: *The construction commencement for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project, dated 12 February 2007.*
- /23/ Shanxi Hongyi Glassware Co., Ltd. and Shanxi Huaaoda Green Industry Development Ltd.: *CDM consultation agreement for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project, dated 16 November 2006.*
- /24/ Shanxi Hongyi Glassware Co., Ltd. & Shanxi Huaaoda Green Industry Development Ltd.: *Termination of the CDM consultation agreement, dated 16 May 2007.*
- /25/ Shanxi Hongyi Glassware Co., Ltd.: *Monitoring and operation manual of Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project, version 1 dated August 2009.*
- /26/ Shanxi Hongyi Glassware Co., Ltd. & Cangzhou Mingzhu Plastics Co., Ltd.: *Purchase agreement of natural gas pipeline, dated 6 April 2007.*
- /27/ Shanxi Hongyi Glassware Co., Ltd. & China Jinye Construction Engineering Company: *Supplementary construction contract of natural gas boiler, dated 8 May 2007.*
- /28/ Shanxi Hongyi Glassware Co., Ltd. & Qi county Jieyuan Natural Gas Co., Ltd.: *Agreement for the construction and installation of natural gas pipelines, dated 18*





March 2007.

- /29/ Shanxi Hongyi Glassware Co., Ltd. & Zhangjiagang city Dongfeng Special blower Co., Ltd.: *Purchase Agreement of Centrifugal blowers*, dated 3 April 2007.
- /30/ Shanxi Hongyi Glassware Co., Ltd.: *The annual reports of coal used by Shanxi Hongyi Glassware Co., Ltd.*, dated 2004 to 2006.
- /31/ Jie Xiu City Xiaoweigou Coal Supply Co., Ltd.: *35 copies of invoices of coal purchased by the Shanxi Hongyi Glassware Co., Ltd.*, dated 2004 to 2006.
- /32/ Shanxi Hongyi Glassware Co., Ltd.: *The annual reports of glass generated by Shanxi Hongyi Glassware Co., Ltd.*, dated 2004 to 2006.
- /33/ Shanxi Hongyi Glassware Co., Ltd.: *The sales receipts of glass by Shanxi Hongyi Glassware Co., Ltd.*, dated 2004 to 2006.
- /34/ Shanxi Coal Quality Certification Center: *Report on net calorific value (NCV) for the coal used by the Shanxi Hongyi Glassware Co., Ltd.*, dated 30 June 2006.
- /35/ Qi county Jieyuan Natural Gas Co., Ltd.: *Report on NCV for the natural gas supplied to Shanxi Hongyi Glassware Co., Ltd.*, dated 26 October 2007.
- /36/ Chengde Huafu Glass Technology Engineering Co., Ltd.: *Inspection of technical parameters of 2 glass kilns*, dated May 2005.
- /37/ Shanxi Hongyi Glassware Co., Ltd.: *Invoices of natural gas consumed by the Shanxi Hongyi Glassware Co., Ltd.*, dated July 2008 to 2010.
- /38/ Shanxi Hongyi Glassware Co., Ltd.: *Monthly statistics of glass produced by the Shanxi Hongyi Glassware Co., Ltd.*, dated July 2008 to 2010.
- /39/ Shanxi Hongyi Glassware Co., Ltd.: *30 copies of answered questionnaire for the stakeholder comments*, dated August 2006.
- /40/ Trading Emissions PLC: *Energy efficiency analysis*, dated 6 September 2011.
- /41/ Hebei province Chengde Fuhua Engineering Technology Co., Ltd.: *The explanation for why the energy consumption per unit of glass production if fired with coal is higher than the one if fired with natural gas (inclusive the anticipated heat loss in case of using different fuel types)*, dated 14 September 2011.

### 3.1.2 Letters of approval

- /42/ NDRC of China (DNA of China): *Letter of approval (LoA) for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project* dated April 2009.  
<http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3576>
- /43/ Department of Energy and Climate Change of United Kingdom of Great Britain and Northern Ireland (DNA of Annex I Party): *LoA for Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project*, dated 12 March 2010.  
[http://www.decc.gov.uk/assets/decc/what%20we%20do/global%20climate%20change%20and%20energy/tackling%20climate%20change/intl\\_strategy/mechanisms/clean\\_dev/1\\_20100527094605\\_e\\_@@\\_cdmukapprovedprojects.pdf](http://www.decc.gov.uk/assets/decc/what%20we%20do/global%20climate%20change%20and%20energy/tackling%20climate%20change/intl_strategy/mechanisms/clean_dev/1_20100527094605_e_@@_cdmukapprovedprojects.pdf)



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

- /44/ CDM Executive Board: *Validation and Verification Manual*. Version 1.2, EB55.
- /45/ CDM Executive Board: *Baseline and monitoring methodology AMS-III.B, version 14, Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, Type III – other project activities, categories III.B – Switching fossil fuels*, adopted Annex 23 EB47.
- /46/ CDM Executive Board, Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities: *Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*. Version 06, 30 September 2005.
- /47/ CDM Executive Board: *General Guidelines to SSC CDM methodologies*, Version 15, Annex 23 EB 58, dated 26 November 2010.
- /48/ CDM Executive Board: “*Guidelines for completing the project design document and the proposed new baseline and monitoring methodologies*”, version 7, adopted at EB41, dated 2 August 2008.
- /49/ CDM Executive Board: *Guidelines on the demonstration and assessment or prior consideration of the CDM*, EB 49 Annex 22.  
[http://cdm.unfccc.int/EB/049/eb49\\_repan22.pdf](http://cdm.unfccc.int/EB/049/eb49_repan22.pdf)
- /50/ CDM Executive Board: *Glossary of CDM terms*, version 5.  
[http://cdm.unfccc.int/Reference/Guidclarif/glos\\_CDM.pdf](http://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf)
- /51/ CDM Executive Board: *Guidelines on the assessment of investment analysis, version 3.1, EB51 Annex 58*.
- /52/ CDM Executive Board: *Tool to determine the baseline efficiency of thermal or electric energy generation systems*, version 1, dated annex 12 of EB48.

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

- /53/ IPCC: *IPCC Guidelines for National Greenhouse Gas Inventories Reference Manual*, dated 2006.
- /54/ Ministry of Justice of the People’s Republic of China: *Environmental Protection Law of the People’s Republic of China*, dated 26 December 1989.
- /55/ Ministry of Justice of the People’s Republic of China: *the Law of the People's Republic of China on Evaluation of Environmental Effects*, [2002] No.77, dated on 1 September 2003.
- /56/ China’s National Development and Reform Commission and Construction Ministry: *Methods and Parameters for Economic Assessment of Construction Projects (version 3)*, dated December 2006.
- /57/ State Council: *Provisional Regulations of the People’s Republic of China on Enterprise Income Tax (indicating the rate of enterprise income tax is 33%)*, State Council No.137 [1993], valid from 1 January 1994 to 31 December 2007.  
[http://www.gdpy.com.cn/glpj/swzs/ds/sd\\_01.htm](http://www.gdpy.com.cn/glpj/swzs/ds/sd_01.htm)
- /58/ State Council: *Provisional Regulations of the People’s Republic of China on Value*



- Added Tax (indicating the rate of value added tax is 17%), State Council No.134 [1993], valid from 1 January 1994 to 31 December 2008.*  
[http://www.gov.cn/banshi/2005-08/19/content\\_24733.htm](http://www.gov.cn/banshi/2005-08/19/content_24733.htm)
- /59/ China glass association: *Proof regarding the experienced range of fuel consumption ratio per ton of glass production in China*, dated 21 October 2010.
- /60/ China NDRC: *Measures for Operation and Management of CDM Projects in China*, date 18 October 2005  
<http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=458>
- /61/ China State Council: *Rules of Construction Projects Quality Control*, State Council No.279, dated 10 January 2000 and effected 30 January 2000.
- /62/ State Council: *Provisional Regulations of the People's Republic of China on Enterprise Income Tax*, Guo Wu Yuan Ling [1993] No.137, dated 13 December 1993 and effected on 1 January 1994.  
[http://www.chinacourt.org/flwk/show.php?file\\_id=18559#0](http://www.chinacourt.org/flwk/show.php?file_id=18559#0).
- /63/ UNFCCC CDM website: *The PDD of the proposed project publicly available for comments*, dated 5 September 2009.  
<http://cdm.unfccc.int/Projects/Validation/DB/IZ2OLA7QC9V3866EKGHXBSh92PL714/view.html>
- /64/ NDRC: *Natural Gas Utilization Policy*, dated 30 August 2007.  
[http://www.ndrc.gov.cn/zcfb/zcfbtz/2007tongzhi/t20070904\\_157244.htm](http://www.ndrc.gov.cn/zcfb/zcfbtz/2007tongzhi/t20070904_157244.htm)
- /65/ General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China: *Measurement of gas flow in closed conduits – Turbine meters*, ISO9951:1993, issued 17 January 2003 and 1 August 2003.
- /66/ Ningbo Trunsun Instrument Co., Ltd.: Calibration certificates of gas intelligent turbine flowmeter (series number 2599), dated February 2008 and February 2009.  
Ningbo Trunsun Instrument Co., Ltd.: Calibration certificate of gas intelligent turbine flowmeter (series number 2604), dated February 2008 and February 2009.
- /67/ General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China: *The laws on the metrology of the People's Republic of China – turbine flowmeters*, JJG 1037 – 2008, issued 25 March 2008 and effected 25 June 2008.
- /68/ Cixi City Administrative Bureau of Quality Supervision and Inspection: *Certificate for examination of measurement standards accredited to Ningbo Trunsun Instrument Co., Ltd.*, valid up to 25 March 2012.
- /69/ State Bureau of Technical Supervision: *The laws on the metrology of the People's Republic of China – digital indicating weighing instrument*, JJG539-1997, issued 1 September 1997 and effected 1 March 1998.
- /70/ Shanxi Province Administrative Bureau of Quality and Technology Supervision: *Certificate of metrological authorization to national legal metrological verification institution for Qixian Technology Quality Supervision, Inspection & Testing Agency*, issued 27 July 2009 to 30 May 2013.
- /71/ Qi county Jieyuan Natural Gas Co., Ltd.: *Invoices of natural gas supplied to Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project*, dated 2009 and 2010.
- /72/ Shanxi Hongyi Glassware Co., Ltd.: *The monthly records of glassware production by*



- Shanxi Hongyi Glassware Co., Ltd.*, dated 2009 and 2010.
- /73/ China Glass Association: *The proof indicating that the structure, volume and the melting area of glass kilns remain consistent, and the melting percentage and melting point in temperature stay unchanged after the fuel switching*, dated 13 September 2011.
- /74/ Qinghangdao Institute of Glass Industry: *The calculation of glass kilns using different fuel types*, dated 2008.
- /75/ Council of Industrial Boiler Owner: *Energy Efficiency and Industrial Boiler Efficiency*, March 2003.

The main differences between the web-hosted PDD and the final version submitted for registration are as follows:

- The combustion devices are the geographical and physical sites where the fuel switch physically takes place. Therefore, the project boundary in the final PDD was updated to the natural gas combustion devices and the natural gas flow monitoring system, which is affected by the fuel switching.
- The applicability to the methodology AMS-III.B, version 14 has been adequately justified in the final PDD.
- As shown in the webhosted PDD, the name of the project participant in host country was “Shanxi Hongyi Glassware Co., Ltd. Co., Ltd”. It is found to be a typo and thus updated to be “Shanxi Hongyi Glassware Co., Ltd.” in the final PDD.
- The main financial parameter “Heating Cost” has been removed from section B.5.
- The sensitivity analysis to test the robustness of additionality conclusion under different conditions has been included in the PDD.
- The net calorific value of natural gas (NCV) has been moved from the table B.6.2 “Data and parameters that are available at validation” to the table in the B.7 “data and parameter monitored”. And the measurement methods and procedures applied to monitor this parameter have been included in the monitoring plan.
- The monitoring plan has been further specified with the addition of reporting and calibration procedures etc.
- The starting date of crediting period has been updated from 1 January 2010 to 1 July 2011.
- Other changes related to the CARs and CLs identified in this validation report.

After reviewing the revised PDD, version 4 dated 14 September 2011 /1/, DNV issued this final validation report and opinion.

### 3.2 Follow-up interviews with project stakeholders

DNV performed the on-site visit to “Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project” on 23 October 2009 since the project was already commissioned. Representatives of the project owner, “Shanxi Hongyi Glassware Co., Ltd. Small-scale Fuel Switching Project” and the project participant, Trading Emissions PLC were interviewed to resolve the issues identified during the desk review of the PDD version 2 dated 19 March 2009 /1/.



Table below provides the information regarding the issues discussed during the site visits:

	<b>Date</b>	<b>Name</b>	<b>Organization</b>	<b>Topic</b>
/76/	2009-10-23	Mr. Zhang Teng Mr. Huo Jiankui	Shanxi Hongyi Glassware Co., Ltd. (project owner)	<ul style="list-style-type: none"> <li>➤ Project background information.</li> <li>➤ Project technology, operation, maintenance and monitoring capability.</li> <li>➤ Project additionality.</li> <li>➤ Project monitoring and management plan.</li> <li>➤ Project approval status (incl. EIA approval, CDM project approval status)</li> <li>➤ Stakeholder consultation process</li> </ul>
/77/	2009-10-23	Mr. Yu Zhanying, Ms. Huang Li	Trading Emissions PLC (CERs buyer)	<ul style="list-style-type: none"> <li>➤ Applicability of selected methodology.</li> <li>➤ Baseline determination.</li> <li>➤ Emission reductions calculation.</li> <li>➤ Emission reduction</li> <li>➤ Monitoring plan</li> </ul>

### 3.3 Resolution of outstanding issues

The objective of this phase of the validation is to resolve any outstanding issues which needed 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 validation protocol in Appendix A is based on the project design as documented and described in the PDD, version 4 dated 14 September 2011 /1/.

The findings of the validation of the project design as documented and described in earlier version(s) of the PDD are described in the initial validation protocol included in Appendix B to this report.

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**

<b>Requirement</b>	<b>Reference</b>	<b>Conclusion</b>
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (OK) or a <b>corrective action request (CAR)</b> if a requirement is not met.</i>

**Validation Protocol Table 2: Requirement Checklist**

<b>Checklist question</b>	<b>Reference</b>	<b>Means of verification (MoV)</b>	<b>Assessment by DNV</b>	<b>Draft and/or Final Conclusion</b>
<i>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</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Means of verification (MoV) are <b>document review (DR)</b>, <b>interview (I)</b> or any other follow-up actions (e.g., on site visit and telephone or email interviews) and <b>cross-checking (CC)</b> with available information relating to projects or technologies similar to the proposed CDM project activity under validation.</i>	<i>The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.</i>	<i>OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A <b>corrective action request (CAR)</b> 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 <b>clarification request (CL)</b> is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. A <b>forward action request (FAR)</b> during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.</i>

**Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests**

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

**Validation Protocol Table 4: Forward Action Requests**

<b>Forward action request</b>	<b>Ref. to checklist question in table 2</b>	<b>Response by project participants</b>
<i>The FARs raised in Table 2 are repeated here.</i>	<i>Reference to the checklist question number in Table 2 where the FAR is explained.</i>	<i>Response by project participants on how forward action request will be addressed prior to first verification.</i>

**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

<i>Role</i>	<i>Last Name</i>	<i>First Name</i>	<i>Country</i>	<i>Type of involvement</i>						
				Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA 1.1 competence	Financial expertise
Team leader (CDM Validator)	Kakaraparthi Venkata	Raman	India	✓		✓	✓		✓	
CDM Validator	Xue	Yanju Andi	China	✓		✓				
CDM Validator	Lai	Chee Keong	China	✓	✓					✓
CDM Validator	Huang	Peng	China	✓	✓	✓				
Assessor under training	Osadchiev	Alexander	Russia						✓	
Technical reviewer	Chandrashekara	Kumaraswamy	India					✓		
Person with sectoral competence assisting technical reviewer	Hou	Bao Jun	China					✓	✓	

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





## 4 VALIDATION FINDINGS

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

The final validation findings relate to the project design as documented and described in the PDD, version 04 dated 14 September 2011 /1/.

### 4.1 Participation requirements

The project's host Party is China and the participating Annex-I country is United Kingdom of Great Britain and Northern Ireland. Both China and United Kingdom of Great Britain and Northern Ireland fulfil the participation requirements and have ratified the Kyoto Protocol. The project participants are Shanxi Hongyi Glassware Co., Ltd. (as the project owner) and Trading Emissions PLC (as the CER buyer).

The DNA of China issued a Letter of Approval (LoA) /42/ authorising Shanxi Hongyi Glassware Co., Ltd. as a project participant and confirming that the project assists in achieving sustainable development.

The DNA of United Kingdom of Great Britain and Northern Ireland issued the LoA /43/ authorising Trading Emissions PLC from the United Kingdom of Great Britain and Northern Ireland as a project participant.

The two LoAs were received from the project participants. The authenticity of LoA from China has been verified from the website of DNA of China's /42/. The authenticity of LoA from Annex I party has also been verified from the website of DNA of United Kingdom of Great Britain and Northern Ireland /43/. DNV considers the letters to be in accordance with paragraphs 45- 48 of the VVM /44/.

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

### 4.2 Project design

The project is a small-scale fuel switching project located in the Xiliuzhi Village, part of the Xiliuzhi Contryside in Qi County, Jinzhong City, Shanxi Province, P. R. China. The geographical coordinates are north latitude 37°4'5" and east longitude 112°1'25", which are confirmed to be consistent with the FSR /2/. The project envisages the switching of fuel from high carbon intensive coal to less carbon intensive natural gas in the two glass kilns. The project involved the changing of the fuel combustion devices on the furnace, laying the NG pipeline and control and measurement systems. All the other equipments related to glass-making remain unchanged. DNV has verified the project implementation to be as stated in the PDD, version 4 dated 14 September 2011 /1/ and the FSR /2/ from the site visit observations.

The project activity starting date is defined as 10 February 2007 as per the *Engineering procurement and construction contract* /9/ which is considered as the earliest financial commitment for the project activity.



The project's system boundaries are clearly defined as the glass kilns and combustion devices where the fuel switch occurred. The expected operational lifetime (i.e. remaining lifetime of the existing heat generation facility) is 25 years, which was confirmed from the FSR /2/.

The project developer has selected a renewable crediting period of 7 years starting from 1 July 2011 or the actual date of CDM registration. The project is expected to reduce GHG emissions by 45 251 tCO<sub>2</sub>e per year.

The proposed project is not a debundled component of a larger project as there is no registered CDM project activity or other projects to apply for CDM registration with the same project participants, which is confirmed by DNV through visiting the project site and checking the CDM projects approved by the NDRC.

DNV considers the project description of the project contained in the PDD, version 4 dated 14 September 2011 to be complete and accurate /1/. The PDD complies with the relevant forms and guidance for completing the PDD /48/.

### 4.3 Application of selected baseline and monitoring methodology

The project applies the approved baseline methodology AMS-III.B, version 14 – Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories-Type III.B. - Switching fossil fuels /45/. The applicability of this methodology is justified as:

- 1) The project activity involves the fuel switching from coal to less carbon intensive natural gas and not any renewable energy based on the existing industrial application (glassware production). The applicability has been verified through conducting the on site visit and interviewing with the representatives of the project owner in China /76/ and referencing the FSR and its approval /2/.
- 2) The project activity only involves switching fuel from coal to natural gas in the two glass kilns within the facility /2/. In the absence of the proposed project activity, only coal was used as fuel; after the implementation of the proposed project activity, only natural gas was used as fuel. The applicability has been verified through performing the on site visit.
- 3) With the fuel switch from coal to natural gas, the fuel combustion devices are replaced to adapt the existing glass kilns. The applicability has been verified through carrying out the on-site visit, reviewing of the relevant contracts /9/ /27/ and referencing the FSR /2/.
- 4) The project activity primarily aims at reducing emissions through fuel switching. Its applicability has been verified through interview with the representatives of the project owner in China /76/ and confirmed the relevant information provided by the interviewed personnel by the FSR /2/ and its approval /2/.
- 5) The project activity is not a Greenfield project and the remaining lifetime of the affected system does not increase due to the project activity, which has been verified through reviewing the FSR /2/.
- 6) The project activity does not involve the switch from the fossil fuel to renewable energy or waste gas, which has been verified through carrying out the on site visit and interview with the representatives of the project owner /76/ and reviewing the FSR and its approval /2/.



- 7) The project activity does not cover emission reductions on account of shift from use of grid electricity. Its applicability has been verified through the check during the on site visit and the review of the FSR and its approval /2/.
- 8) The natural gas consumption and energy use (i.e. glass production) can be directly measured and recorded within the project boundary. The monitoring-related information can be identified in the monitoring plan of PDD version 4 dated 14 September 2011 /1/ and the *monitoring and operation manual* /25/.
- 9) The project participant Shanxi Hongyi Glassware Co., Ltd. is a manufacturer of glassware and the heat generated under the project activity is for the on-site captive use, i.e for the glass production. It can be confirmed through the FSR /2/ and on-site inspection.
- 10) There are no regulations to constrain the facility from using the energy sources before and after the fuel switch. There is no regulation in the host country to use low carbon energy source such as natural gas. Its applicability has been verified through the review of *Natural Gas Utilization Policy* /64/. As per the *Natural Gas Utilization Policy* /64/, it is permitted to develop the projects with the fuel switch from coal to natural gas in the building materials, mechanics, fabrics and other industrial sectors in China. No mandatory regulations to use the low carbon energy sources (like natural gas) have been existed in China.
- 11) The project activity does not result in any integrated process change. Besides switch of energy source, the operation conditions, type of raw material processed and type (or quality) of products manufactured have not been changed by the project activity. It has been verified against the FSR /2/ and the interview with the representatives of the project owner /76/.
- 12) The project activity will result in an estimated 45 251 tCO<sub>2</sub>e emission reductions annually, within the eligibility limit of 60 kt CO<sub>2</sub>e/year /47/.

The assessment of the project's compliance with the applicability criteria of AMS-III.B (version 14) 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

In compliance the applied methodology AMS-III.B (version 14) /45/, the project boundary includes the installation of natural gas combustion system (where the switch of energy source was taken place) and the natural gas flow monitoring system (affected by the switching).

The selected sources and gases are justified for the project activity. Emission sources and gases included in the project boundary are:

	<i>Source</i>	<i>GHGs involved</i>	<i>Description</i>
Baseline emissions	Emission from coal	CO <sub>2</sub>	The baseline emission factor for the proposed project activity is determined as ex-ante. Its calculation is referred to the section 4.8 of this validation report.



Project emissions	Emission from natural gas	CO <sub>2</sub>	Project emissions are resulted from the combustion of natural gas. It calculation refers to the section 4.8 of this validation report.
Leakage	No	N/A	No leakage calculation is required in applying this methodology.

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.B (version 14) /45/.

## 4.5 Baseline identification

In accordance with the methodology AMS-III.B (version 14) /45/, the baseline scenario is defined as the continuation of the current practice of using coal as fuel in the combustion devices connected to two glass kilns of the glass factory. The historic information of three years prior to the project implementation, in terms of the coal consumption and product output (glass) has been used to arrive at the emission factor for the baseline situation, i.e.  $EF_{BSL}$  (tCO<sub>2</sub>/ton of glass). DNV has verified the historic data on the coal consumption and the glass manufactured and confirms the baseline determination to be transparent and reasonable. The historic data considered is for the years 2004, 2005 and 2006. The emission factor in the baseline scenario is calculated to be 3.1138 tCO<sub>2</sub>/ton of glass (the detailed calculation process can be referred to in the section 4.8).

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

All the assumption and data used by the project participants are listed in the PDD and/or supporting documents. All documentation relevant for establishing the baseline scenario are correctly quoted and interpreted in the PDD. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.

## 4.6 Additionality

The additionality of the proposed project has been demonstrated by applying the Attachment A to Appendix B to the simplified modalities and procedures for small-scale CDM project activities /46/.

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

Starting date of this project activity is defined as 10 February 2007 at which the *Engineering procurement and construction contract* was signed /9/. It has been verified to be the earliest time of financial commitment by comparing the other documents, including a) the



construction commencement of the project on 12 February 2007 /22/, and b) purchase agreement of blower on 3 April 2007 /7/. The date of 10 February 2007 for signing *Engineering procurement and construction contract* is thus considered as the starting date of the project /9/, which is prior to the date of PDD publication on 5 September 2009. On the basis of the EB41 Para 67, it is DNV's opinion that this date correctly represents the earliest date of the implementation, construction or real action dates. As per the paragraph 99 of VVM /44/, DNV validation team confirms that the starting date of the project activity, reported in the PDD /1/, is in accordance with the "Glossary of CDM terms" /50/.

**The awareness of the CDM prior to project's start date and the decisiveness of CDM benefits in the investment decision was demonstrated from the following chronological events:**

No.	date	Events
1	June 2006	The FSR was prepared by Shanxi Guoyang Investment Consulting Co., Ltd. /2/, which indicates the project activity has the financial unattractiveness. The project participants were suggested to consider the CDM support.
2	16 August 2006	Approval letter of the FSR was issued by Shanxi Qi County Planning Commission /2/.
3	16 September 2006	The environmental impact report of the project activity was ratified by the Shanxi Qi County Environmental Protection Agency /3/.
4	10 October 2006	The board meeting was held to decide the development of the proposed project with the support of CDM revenue /8/.
5	16 November 2006	CDM consulting contract between the project owner and Shanxi Huaaoda Green Industry Development Ltd. was signed /23/.
6	10 February 2007	<i>Engineering procurement and construction contract</i> signed between Shanxi Hongyi Glassware Co., Ltd. and China Jingye Engineering Co., Ltd.. This is the start date of the project activity /9/.

The CDM development was determined on the board meeting on 10 October 2006 /8/. The CDM consulting contract between the project owner and Shanxi Huaaoda Green Industry Development Ltd. was signed on 16 November 2006 /23/. It is DNV's opinion that these events demonstrate that the project developer was aware of CDM prior to project's start date and CDM benefits were a decisive factor in the decision to proceed with the investment.

Continuing and real actions to secure CDM status in parallel with project's implementation were demonstrated from the following chronological events:

No.	date	Events
1	10 February 2007	<i>Engineering procurement and construction contract</i> was signed between Shanxi Hongyi Glassware Co., Ltd. and China Jingye Engineering Co., Ltd.. This date was substantiated as the start date of this project activity /9/.



2	12 February 2007	Construction commencement was approved by Shanxi Qi County Planning Commission /22/
3	1 April 2007	The technical specification of blowers was issued by Zhangjiagang Dongfeng Special Blower-Fan Co., Ltd. /6/
4	3 April 2007	The blower purchase agreement signed between Shanxi Hongyi Glassware Co., Ltd. and Zhangjiagang Dongfeng Special Blower-Fan Co., Ltd. /7/
5	16 May 2007	Contract with Shanxi Huaaoda Green Industry Development Ltd. for CDM development was terminated /24/
6	10 September 2007	1 <sup>st</sup> CDM Training meeting was held by the project owner. /11/
7	7 December 2007	2 <sup>nd</sup> CDM Training meeting was held by the project owner. /11/
8	17 January 2008	Natural gas supply agreement was signed between Shanxi Hongyi Glassware Co., Ltd. and Qixian Haoyuan Natural Gas Co., Ltd. /13/
9	3 October 2008	The emission reductions purchase agreement was signed between Shanxi Hongyi Glassware Co., Ltd. and Trading Emissions PLC /20/
10	20 Feb 2009	The PDD was sent to China DNA for LoA.
11	30 April 2009	The LoA issued by the DNA of China /42/,
12	5 September 2009	The PDD was published on the UNFCCC's website /63/.
13	12 March 2010	The LoA was issued by the DNA from United Kingdom of Great Britain and Northern Ireland /43/.

Since no gaps of more than two years were identified between actions to secure CDM status, sufficient actions to secure CDM status in parallel with the physical implementation of the project activity was confirmed. 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 /49/.

#### 4.6.2 Identification of alternatives to the project activity

Two alternatives that supplies the equivalent thermal energy generation compared with the proposed project activity have been identified and discussed,

- a) The proposed project activity undertaken without being registered as the CDM project;
- b) Continuation of the present practice of using coal fuel.

Alternative a) would not occur anyway due to the investment barrier, i.e. financially less viable than the alternative b). The explicit explanation can be referred to section 4.6.3 of this report. The alternative a) that faced the investment barrier was eliminated from the realistic alternatives. Hence the left alternative b) was selected as the baseline scenario.

DNV considers the listed alternatives to be credible and complete.





### 4.6.3 Investment analysis

#### Choice of approach

As discussed above, the project participant had two options of a) continuation of the present practice and b) implementation of the project without being registered as a CDM project activity. The additionality of the proposed project activity has been demonstrated using the investment comparison analysis of the two options and is demonstrated that the baseline option (continuation of the present practice) is financially more viable than the project scenario.

The financial indicator of NPV has been selected to evaluate the financial viability of the project. Referring to the *Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities* /46/ and in consideration that there is no cash inflow for both the baseline and project scenario, it is confirmed by DNV that the approach of net present value (NPV) investment comparison analysis is appropriate for the proposed project.

#### Discount rate selection

In line with the *Methods and Parameters for Economic Assessment of Construction Projects* (version 3) in China /56/, the investment benchmark of 12% Internal Rate of Return (IRR) applicable for glass industry has been selected as the discount rate for the project activity. This discount rate is widely used by Chinese authorities for assessing the financial viability of potential new projects in glass industry, and it deemed to be reasonable and appropriate for this project activity. The rate was available at the time of decision. The discount rate of 12% is used in both the alternatives and additionality is being demonstrated by the investment comparison, and is reasonable in DNV's opinion.

#### Input parameters

A FSR in China is required to be developed by a qualified third party, like Shanxi Guoyang Investment Consulting Co., Ltd. accredited for this task directly by the Chinese government. An approval letter of the FSR is issued by the government only after it passes the public assessment of the sector experts designated by the government. It is in DNV's opinion that FSR can be regarded as a reliable and trustworthy source of information coming from a recognized entity once it has the approval letter from the government.

All the parameters used in the financial analysis have been sourced from the FSR prepared in June 2006, and further approved by Shanxi Qi County Planning Commission on 16 August 2006 /2/. Hence, the parameters from the FSR can be considered information provided by an independent and recognized source.

DNV compared the input parameters for the financial analysis included in the PDD version 4 dated 14 September 2011 /1/ with the parameters stated in FSR /2/ and was able to confirm that all the values applied are consistent with the value stated in the FSR /2/.

The FSR was approved on 16 August 2006 /2/, and thus six months prior to the decision to proceed with the project activity (i.e. the start date of the project) which was on 10 February 2007 /9/. Given this relatively 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 approved FSR has been the basis of the decision to proceed with the investment in the project.



On the basis of the specific local and sectoral expertise, DNV confirms the input parameters applied by the project to be valid and applicable at the time of investment decision, by cross-checking or other appropriate manners, as stated below.

### 1) Total static investment

The project total static investment (4.968 million RMB) is sourced from the FSR /2/. DNV has verified the purchase agreements /7/ /9/ /26/ as well as other relevant contracts and documents for construction related services /27/ /28/, and is able to conclude that the total contracted expenses is 4.6866 million RMB. The total contracted value accounts for the 94.33% of the total static investment (4.968 million RMB) as estimated in the FSR /2/. Therefore, the total static investment applied in the financial analysis of the project activity is considered to be appropriate at the time of investment decision.

Equipments/Construction/others	Contracted amount (million RMB)
Supplementary construction contract of natural gas boiler /27/	0.1433
Agreement for the construction and installation of natural gas pipelines /28/	1.3000
Centrifugal blowers /7/	0.0110
Natural gas pipelines /26/	2.4497
Engineering procurement and construction contract /9/	0.7826
Total	4.6866

### 2) Natural gas price

The natural gas price as 2.3 RMB/Nm<sup>3</sup> adopted by this project activity is sourced from the FSR /2/. This price was sourced from the *Intention of natural gas supply* signed between the project owner and the natural gas supplier Qi county Jieyuan Natural Gas Co., Ltd. on 2 May 2006 /12/. As per the document /12/, the service of supplying natural gas was agreed at a price of 2.3 RMB/Nm<sup>3</sup>.

To further validate the appropriateness of this value, it has been cross checked with the natural gas supply agreement signed by the project owner with the same supplier in 2008 /13/ and the invoices of purchase of natural gas in the year 2008, 2009 and 2010 (indicating the natural gas prices of 2.03, 2.12 and 2.42 RMB/Nm<sup>3</sup>) /14/ /15/ /16/. Moreover, referring to the “Notice on the prices of natural gas in Jinzhong City” in 2009 /17/, the natural gas price (use for industry) in 2009 was already increased to 2.4 RMB/Nm<sup>3</sup> in the year 2009. Therefore, DNV confirms the natural gas price from the FSR /2/ is applicable and conservative at the time of investment decision.

### 3) Coal price





The coal price of 385 RMB/ton adopted by the project is sourced from the FSR /2/. This has been cross checked against the invoices of purchasing coal in January 2007 /18/, which is slightly lower at 382 RMB/ton. The coal price applied by the project activity was slightly higher than the most recent coal price before the project investment decision on 10 February 2007. DNV observes that even if the price of 382 RMB is considered, the project NPV does not touch the baseline NPV. Hence the application of this price as deemed by the project is considered to be conservative and valid.

To further validate the appropriateness of coal price, the proof of indicating the coal prices in the years 2008 and 2009 from the same coal supplier Jie Xiu City Xiaoweigou Coal Supply Co., Ltd. /18/, has been checked by DNV. Based on the document /18/, it is identified that the coal prices in 2008 and 2009 are respectively 415 RMB/ton and 398 RMB/ton. Hence the selection of the coal price at 385 RMB/ton is considered applicable and reasonable at the time of investment decision.

As an assumption applied by the project activity, the current fuel prices of each fuel (including the coal and natural gas) are assumed as future fuel prices (variable costs). Hence, no price escalation of each fuel has been taken into consideration in the NPV analysis.

DNV confirms that the underlying assumption in the financial calculation is appropriate since there are no future prices substantiated by a public and official publication from a governmental body or an intergovernmental institution.

Furthermore, the price variation of coal and natural gas has been considered in the sensitivity analysis (refer to the last part of section 4.6.3 Investment analysis). Its results demonstrate that the variation of coal and natural gas to arrive at the same NPV between the baseline and project scenarios is of highly unlikeliness.

#### **4) Glass production**

The glass production figure of 24 000 ton/year is sourced from the FSR /2/. The plant consists of two glass furnaces with individual rated capacity of 2 000 ton/year and 22 000 ton/year respectively in accordance with the FSR /2/. Therefore, the rated capacity of this plant is aggregated to be 24 000 ton/year.

To further validate the appropriateness of this parameter, the inspection of technical parameters from the equipment supplier has been checked by DNV /36/. The capacity of each furnace indicated in this document /36/ is consistent with the description in the FSR /2/. Therefore, DNV confirms that the glass production figure applied by the project is valid and suitable at the time of investment decision.

#### **5) Fuel operating cost of coal and natural gas**

##### *Fuel operation cost of coal*

The fuel operation cost of coal (547 RMB/ton) is sourced from the FSR /2/. The annual fuel operation cost of coal is equal to the coal price (385 RMB/ton) multiplied by the fuel consumption ratio of coal (1.42). The fuel consumption rate of coal (1.42) is sourced from the FSR /2/.



To further validate the appropriateness of fuel operation costs, the average weighted value of fuel consumption ratio in the three years prior to the implementation of project activity (i.e. the years 2004, 2005 and 2006), has been evaluated as below,

*Historical coal use and glassware generated*

Year	coal use (ton)	Glassware generated (10000 ton)	Coal consumption ratio
	A	B	C=A/B
2004	22368.9 /30//31/	1.6 /32//33/	1.398
2005	30368.45 /30//31/	2.2 /32//33/	1.380
2006	35149.88 /30//31/	2.36 /32//33/	1.489
Average			1.42

As indicated in the table above, the average fuel consumption rate of coal in the years 2004 to 2006 is calculated to be 1.42 ton per ton of glass production, which is consistent with the value estimated in the FSR /2/. DNV has also verified from the statistics made by the China glass association /59/, the fuel consumption ratio of coal varies from 1.32 to 1.52 ton per ton of glass production in China. The fuel consumption ratio of coal adopted by this project is validated to be within the range. Therefore, the fuel consumption ratio is confirmed by DNV to be valid and applicable at the time of investment decision.

#### Fuel operation cost of natural gas

The fuel operation costs of natural gas (1 341 RMB/ton of glass) is sourced from the FSR /2/. It is equal to the natural gas price (2.3 RMB/Nm<sup>3</sup>) multiplied by the fuel consumption ratio of natural gas (583m<sup>3</sup> per ton of glass).

The fuel consumption ratio of natural gas (583 Nm<sup>3</sup> per ton of glass) is sourced from the FSR /2/. The appropriateness of fuel consumption ratio of natural gas is justified through comparing with the experienced range /59/. According to the statistics made by the China glass association, the fuel consumption rate of coal ranges from 545 to 620 Nm<sup>3</sup> per ton of glass production in China /59/. The value used by the project activity at 583 Nm<sup>3</sup> per ton of glass, is validated to be within this range. Furthermore, the aggregated actual consumption ratio for natural gas from July 2008 to December 2010 is calculated to be 584 Nm<sup>3</sup> per ton of glass, on the basis of the invoices of monthly natural gas consumption /37/ and monthly statistics of glass production /38/. Its difference from the estimated value is slight, thus the consumption rate of natural gas applied by this project activity is deemed to be appropriate.

#### **6) Amount of natural gas consumed per year**

The amount of natural gas annually consumed in the furnaces (14 000 000 Nm<sup>3</sup>/year) was sourced from the FSR /2/. It was calculated on the basis of the estimated annual glass production (24 000 ton/year) and the fuel consumption ratio of natural gas (583 Nm<sup>3</sup> per ton of glass). Therefore, the suitability of this parameter (amount of natural gas consumed per year) is confirmed by DNV.

#### **7) Taxes**

The rates of taxes applied in the project financial assessment are shown below:

- Rate of value added tax (VAT): 17%



- Rate of enterprise income tax: 33%

(i) Rate of VAT

VAT is a tax that applies to the business transactions involving the transfer of goods and services. It is thus applicable to the proposed project. When the business is registered for VAT, it will pay VAT on its purchase of equipments and charge VAT on its sales. As for the proposed project the VAT rate of 17% is applied in the NPV calculation, which is in line with the *Provisional Regulations of the People's Republic of China on Value Added Tax from China State Council* (state Council No. 134 [1993], valid from 1 January 1994 to 31 December 2008 /58/.

(ii) Rate of Enterprise income tax

The rate of enterprise income tax (33%) applied in the financial analysis of the proposed project is in line with the *Provisional Regulations of the People's Republic of China on Enterprise Income Tax* (State Council No.137 [1993], valid from 1 January 1994 to 31 December 2007) /57/.

### Calculation and conclusion

The NPV calculation was provided to DNV by Trading Emissions PLC in a spreadsheet /4/, and DNV was able to verify the assumptions made and that the calculations are carried out correctly. The NPV calculations demonstrate the NPV of the project (-17 207 RMB) is less attractive than the NPV of the baseline (-6 895 RMB), i.e. there is a difference of -10 312 RMB between the NPV of the baseline situation and the proposed project considering the necessary investment for the fuel switch, the increase in energy costs and the increase in the operation costs resulting from the use of natural gas instead of coal. Hence, the proposed project is not to be the most financially attractive alternative. With the CER revenues, the project NPV will be escalating to 27 480 059 RMB.

### Sensitivity analysis

The variables that constitute more than 20% of either the investment cost of project activity or the investment cost of baseline scenario or total project revenues have been subjected to reasonable variation, and the result has been presented in the PDD /1/ and reproducible in the associated NPV spreadsheet /4/.

A sensitivity analysis has been carried out, varying the total investment, the coal price and the natural gas price. The NPV of project activity is still negative and less than the NPV of baseline scenario when the total static investment, coal price and natural gas price varied from -10% to +10%.

DNV was able to verify the calculations in the sensitivity analysis by varying the input parameters in the NPV analysis. For reasonable variations of the input parameters, the NPV is still lower than the NPV of baseline scenario and the proposed project without the carbon revenues is deemed not to be the most financially attractive scenario. The sensitivity analysis covers in DNV's opinion the relevant parameters and with reasonable variations.

DNV was able to verify that the project NPV will be equal to the NPV of baseline situation only if the parameters change by values as mentioned below:



<i>Key Indicators</i>	<i>Variation of the parameter indicator needed to reach the equivalence of project NPV and the NPV in the baseline scenario</i>
Static investment costs	-100%
NG price	-60.98%
Coal price	+149.57%

- **Static Total Investment:** DNV was able to confirm that the reduction by more than 100% in investment costs is unlikely to happen. Even if the total static investment is fully removed, the NPV of the proposed project activity will be -16 911 RMB, still lower than the NPV of coal (-6 895 RMB).
- **Price of natural gas:** For a 60.98% decrease in the price of natural gas, the project NPV minus the baseline NPV will be zero. The price of natural gas adopted by the project activity (2.3 RMB/Nm<sup>3</sup>) is sourced from the FSR /2/. According to the invoices of purchasing the natural gas, the price of natural gas has been increasing by 19% from 2008 to 2010 /14//15//16/. Therefore, a decrease of the price of natural gas by 60.98% during the whole crediting period is highly unlikely.
- **Coal price:** For a 149.57% increase in the price of coal, the project NPV minus the baseline NPV will be zero. The price of coal adopted by the project activity (385 RMB/ton) is sourced from the FSR /2/ and verified to be close to the price (382 RMB/ton) from the invoices of purchasing coal in January 2007 /18/. Referring to the proof from the coal supplier, the coal price has remained stable over the range from 385 ~ 415 RMB/ton from 2007 to 2009 /19/. Therefore, although an increase in the coal price is observed, it is unlikely that the coal price will increase by as much as 149.57% on average during the crediting period.

In summary, DNV confirms that this project activity is financially less viable than the baseline scenario even after considering the possible fluctuation of the main parameters.

In conclusion, it is DNV's opinion that it has been correctly demonstrated that the project activity is not financially attractive and hence the emission reductions achieved by the project are additional to any would have happened in absence of the project.

## 4.7 Monitoring

The project applies the approved monitoring methodology AMS-III.B, version 14, Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories-Type III.B. - Switching fossil fuels /45/. The applicability of this methodology has been justified in this report, referring to the section 4.3.

The project monitoring plan is in compliance with the monitoring methodology AMS-III.B (version 14) /45/. The monitoring plan will give opportunity for real measurements of achieved emission reductions.



Monitoring of sustainable development indicators is not required by the Chinese DNA according to *Measures for Operation and Management of CDM Projects in China* /60/.

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

#### 4.7.1 Parameters determined ex-ante

The following parameters are determined *ex-ante* and will be kept fixed through the crediting period:

- $FC_{i,j,BL,y}$ : Total amount of coal consumed for glassware production during the year (2004-2006) in the baseline situation. Historical data for the years 2004 to 2006 from the annual reports /30/ has been used by the project activity.
- $NCV_j$ : Net calorific value of coal (TJ/kg). The data are determined from the test report issued by the Shanxi Coal Quality Measuring Center. The test reports have been provided to and validated by DNV /34/, and it is confirmed that the data has been correctly transferred and converted.
- $EF_{CO_2,j}$ : CO<sub>2</sub> emission factor of coal. The lower value of emission factor for coal with the 95% confidence interval from the *IPCC 2006 Guidelines for National Greenhouse Gas Inventories* was selected /53/. DNV can confirm that the value has been appropriately transferred from the source.
- $Q_{BSL,j}$ : Total amount of glassware produced during the year (2004 - 2006) when the fuel of coal is used /32/ /33/. The value was determined on the historical records (2004 - 2006) from the Shanxi Hongyi Glassware Co., Ltd. /32/ /33/. DNV can confirm that the data are correctly transferred from the source.
- $EF_{CO_2}$ : CO<sub>2</sub> emission factor of natural gas. The upper value of emission factor for the natural gas with the 95% confidence interval from the *IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual (2006)* was selected /53/. DNV can confirm that the value is appropriate and it has been correctly transferred from the source.
- $EF_{BSL}$ : Emission factor for the baseline situation. It is the coefficient for coal used in the baseline scenario expressed as emissions per ton of production. It is calculated to be 3.1138 tCO<sub>2</sub>/ton of glass and its calculation can be referred to the section 4.8.

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

Parameters	Unit	Value applied	Source of data used
NCV of natural gas	MJ/Nm <sup>3</sup>	36.12	Qi county Jieyuan Natural Gas Co., Ltd. /35/
$NCV_j$	TJ/t	0.025	Shanxi Coal Quality Measuring Center /34/
$EF_{CO_2}$ of natural gas	tCO <sub>2</sub> /TJ	58.3	IPCC Guidelines for National Greenhouse Gas Inventories /53/
$EF_{CO_2,j}$	tCO <sub>2</sub> /TJ	87.3	IPCC Guidelines for National Greenhouse Gas Inventories /53/
$FC_{i,j,BL,y}$	ton	22 368.9	2004 annual report /30/ cross checked with invoice of coal purchase /31/



		30 368.45	2005 annual report /30/ cross checked with invoice of coal purchase /31/
		35 149.88	2006 annual report /30/ cross checked with invoice of coal purchase /31/
$Q_{BSL,j}$	ton	16 000	2004 annual report /32/ cross checked with receipts of glass sales /33/
		22 000	2005 annual report /32/ cross checked with receipts of glass sales /33/
		23 600	2006 annual report /32/ cross checked with receipts of glass sales /33/

#### 4.7.2 Parameters monitored ex-post

The following parameters will be monitored *ex-post*:

- $FC_y$ : Natural gas consumed for glassware production in the project activity in year  $y$ . This parameter will be measured continuously using the main meter installed at the gateway of the glass factory. One back-up meter is installed at the same place in case the main meter fails to work. The representatives of the project owner and the natural gas supplier *Qi County Jieyuan Natural Gas Co., Ltd.* will simultaneously read the main meter and record the readings monthly. The quantity of the monthly recorded natural gas consumption will be cross-checked with the purchase receipts. The main meter and backup meter applied by the project activity are exactly the gas intelligent turbine flowmeters selected as per the *Measurement of gas flow in closed conduits – turbine flowmeters* /65/. Both of them have the same type (i.e. CQ-100L-1.5-1.6/0.2-IC) and the same measuring range from 32 to 650m<sup>3</sup>/h /66/. The main meter and its backup meter have the accuracy level of 1.5 and will be calibrated once a year by the certified third party *Ningbo Trunsun Instrument Co., Ltd.* /68/ in accordance with the *laws on the metrology of the People's Republic of China – turbine flowmeters* (JJG1037-2008) /67/. The ownership of the two meters is possessed by *Qi County Jieyuan Natural Gas Co., Ltd.*, which has been responsible for the operation and maintenance of the meters. The measures taken by natural gas supplier are in place to guarantee the continuous supply of natural gas. The data collected as part of the monitoring are archived electronically at the project site and will be kept at least for 2 years after the end of the last crediting period.

$Q_{PJ,y}$ : Net production of glassware in the project activity in year  $y$ . This parameter will be monitored daily at project site by the balance scale and platform scale which are used to weight the different type of glassware product. The metered data will be reported on the monthly basis. The quantities of the monthly reported net glassware production will be cross-checked with the sale invoices. The monitoring equipment (balance scale and platform scale) have the accuracy levels of 1g and 200g and will be calibrated once a year by the certified third party *Qixian Technology Quality Supervision, Inspection & Testing Agency* /70/, in accordance with *laws on the metrology of the People's Republic of China – digital indicating weighing instrument* (JJG539-1997) /69/. The balance scale (type: JPT-05) owns the maximum measurement range of 500 g, whereas the platform scale (type: TGT-500A) has the maximum measurement range of 500 kg. The data collected as part of the monitoring are archived electronically and kept at least for 2 years after the end of the last crediting period.





- NCV: Net calorific value of natural gas. This value will be monitored every two weeks by the natural gas supplier Qi county Jieyuan Natural Gas Co., Ltd.. The data will be cross checked with the invoices provided by the natural gas supplier. The data collected as part of the monitoring are archived electronically and kept at least for 2 years after the end of the last crediting period.

#### 4.7.3 Management system and quality assurance

The project's monitoring plan includes:

A description of the responsibilities and authorities for project management;

- Responsibility;
- Reporting;
- Calibration;
- Error Handling Procedure
- External Reporting Procedure
- Procedure for corrective actions arising
- Training
- Data management system.

Detailed procedures have been elaborated in the PDD version 4 dated 14 September 2011 /1/ and *project monitoring and operation manual* /25/. These will be maintained and implemented to enable subsequent verification of emission reductions.

The compliance of monitoring plan contained in the PDD /1/ with the requirements of paragraph 22(a) of applied methodology AMS-III.B version 14 /45/ has been assessed as follows:

##### (a) *Compliance of the monitoring plan with the applied methodology*

The parameters required by the paragraph 22(a) of selected methodology have been identified in the PDD /1/. DNV confirms that they are clearly described and that the means of monitoring described in the monitoring plan complies with the requirements of the methodology.  $Q_{PJ,y}$  will be monitored in terms of production of glassware (in tonnes) in year y while AMS-III.B stipulates to monitor net energy output in the project activity in year y (please refer to below assessment for further details on this).

(b) *Implementation of monitoring plan*(i) The monitoring arrangements described in the monitoring plan are feasible within the project design, which is assessed by reviewing of the monthly records of glassware production /72/, the natural gas purchase invoices /71/ and project monitoring and operation manual /25/.

(ii) The means of implementation of the monitoring plan, including the data management and quality assurance and quality control procedures, are considered by the validation team as sufficient to ensure that the emission reductions achieved by the proposed CDM project activity can be reported ex post and verified. It has been validated by reviewing the relevant documents /25/ /71/ /72/ and the interview with the relevant personnel.

(iii) The monitoring plan is validated to ensure that all the emission reductions are claimed due to the fuel switching measure and not on account of any other measures (such as increase in efficiency, etc).



The emission reductions ( $ER_y$ ) by the project activity are the difference among the baseline emissions ( $BE_y$ ), project emissions ( $PE_y$ ) or leakage ( $Ly$ ). The process of glassware production can be generally summarized in two steps: firstly, the natural gas is combusted to heat the glass kilns where the raw materials (quartz, calcite etc.) are transformed into liquid glass under a certain temperature; secondly, the melted glass is injected to the glass molds and then the glasswares are formed.

The heat output in step 1 is entrapped by the reaction of producing the glass. The liquid glass produced is the medium carrying the heat energy from the combustion of natural gas. The structure, volume and the melting area of glass kilns remain consistent, and the melting percentage and melting point in temperature stay unchanged after the fuel switching /73/, which has built the constant operational circumstance. Under the same operation conditions, the heat output from the same element process can be monitored by measuring the quantity of energy carrier (i.e. produced glass).

In the step 2 the liquid glass is transferred, cooled and formed to glasswares. The difference in quantity between the liquid glass and solid glassware is negligible (the transferrable ratio from liquid glass to solid glassware is 98% and unaffected by the fuel switch /73/).

The heat output generated in one glass facility can not be directly measured since its medium is in the form of liquid glass, which makes the monitoring of glass production necessary.

Furthermore, the thermal efficiency of glass kiln is reflected as the energy consumption per unit of glass production instead of being based on the heat output according to the relevant sectoral information /74/. The thermal efficiency will be higher if the energy consumption per unit of glass production is lower. Therefore, the monitoring of net quantity of glassware production as proxy of the heat output is selected.

The energy consumption per glass production in tonne was 35 558 MJ/ton of glass (calculated based on historical data in 2004, 2005 and 2006) in the baseline scenario, whereas it is 21 121 MJ/tonne of glass (based on the actually collected data in 2009 and 2010) in the project scenario /40/. The difference within the same system, under the same operating conditions /73/, is attributed to the switching of fuel /41/ as the system using various fuel types will result in different efficiencies /52/. The efficiency improvement resulting from the fuel switching embodies the effect of fuel consumption and heat conversion. Distinctive from common boilers generating steam or hot air, glass kilns have to sustain a high flame temperature (around 1800°C) to reach the melting point of liquid glass (around 1500°C) /41/. Such a flame temperature requires the continuous supply of thermal energy /41/. Thermal energy released from combusting coal is mitigating gradually and part of the energy in coal is unavoidably removed with the ash and the contained energy is not fully released. The need for continuous and stable thermal energy supply required by glass kilns aggravated the extent of heat loss in an element process when combusting coal /41/. If fired with natural gas, the above mentioned heat loss will not be applicable. Based on the introduction by the designer of glass kilns applied by the project activity, the estimated energy loss per tonne of glass if fired with coal is 16 000 to 18 000 MJ/tonne of glass and the corresponding value if fired with natural gas is 4000 to 5000 MJ/tonne of glass /41/. As a result, the energy consumption per unit of glass if fire with natural gas is less than the one if fired with the coal. The thermal efficiency if fired with the natural gas is calculated to be 76 - 81% ( $= 1 - \text{heat loss per tonne of glass} / \text{energy supply per tonne of glass} \times 100\%$ ), and it is 44% - 51% ( $= 1 - \text{heat loss per tonne of glass} / \text{energy supply per tonne of glass} \times 100\%$ ) if fired with the coal. The difference of energy efficiency due to the variation of fuel type is verified to be reasonable and consistent with the reference *Energy Efficiency & Industrial Boiler Efficiency* /75/. Thus, it is DNV's opinion





that the efficiency improvement observed following the implementing the project are attributable to the fuel switch only and are not attributed to any other efficiency improvements which could result in a higher glassware output.

The monitoring of  $Q_{PJ,y}$  has enabled the validation team to check whether other measures besides switch of fuel, such as efficiencies improvement etc, have affected the determination of baseline emissions ( $BE_y$ ). The baseline emissions ( $BE_y$ ) have been calculated as the product of the emission factor for baseline scenario ( $EF_{BSL}$ ) multiplied by the net production of glasswares (*refer to the section 4.8 for the detailed information*). The emission factor in the baseline situation ( $EF_{BSL}$ ) is determined ex-ante, thus the baseline emissions will be dependant on the  $Q_{PJ,y}$ . The net glassware production in the project activity ( $Q_{PJ,y}$ ) is limited to the glass furnaces' capacity (24 000tonne/year) in the baseline situation. The actually monitored results of  $Q_{PJ,y}$  are 22 700 tonne/year and 23 800 tonne/year in 2009 and 2010, respectively (after the fuel switch to natural gas) /72/, which is comparable to the quantities of annual glassware production (i.e. 22 000 tonne/year and 23 600 tonne/year) in 2005 and 2006 (before the fuel switch). The stability of glassware production before/after the fuel switch has demonstrated that the determination of baseline emissions was not affected by other measures apart from the fuel switch.

The monitoring of  $FC_y$  and  $NCV$  has enabled the validation team to check whether the determination of project emissions ( $PE_y$ ) is affected by other measures apart from the fuel switch. The project emissions ( $PE_y$ ) include the emissions related with the use of natural gas after the fuel switch and calculated based on the formula  $PE_y = FC_y * EF_{CO2} * NCV$  (*Refer to section 4.8 for detailed information*). The natural gas will be directly supplied to the glass furnaces from *Qi County Jieyuan Natural Gas Co., Ltd.* through the well installed pipelines. The quantity of natural gas consumed by the project activity will be limited by the demand of glassware production. Once the amount of glassware production is relatively steady, the quantity of consumed natural gas will not be visibly fluctuating. The estimated amount of annually consumed natural gas is 14 000 000  $Nm^3$ /year, which has been validated as suitable in the section 4.6. The actually monitored results of  $FC_y$  are respectively 13 265 174  $Nm^3$ /year and 13 926 251  $Nm^3$ /year in 2009 and 2010 /71/ after the implementation of the project activity, which is closed to the estimated value as 14 000 000  $Nm^3$ /year. The monitored result was so close to the estimated one, which has reasonably demonstrated that no measures apart from fuel switching, like efficiency increase, were taken to mitigate the  $FC_y$  and thus reduce the project emissions.

As described in the 4.7.2, the  $NCV$  of natural gas is monitored ex-post in the project activity. This parameter is determined by the physical characteristics of natural gas and unlikely to be affected by the fuel switch or any approaches else. The emission factor of natural gas ( $EF_{CO2}$ ) is ex-ante determined. Therefore, it is deemed by DNV that the claimed project emissions are not accounted on other measures besides the fuel switch. In addition, no leakage calculation is required as per the applied methodology AMS-III.B version 14 /45/.

Based on the discussion given above, the conclusion is that the project activity meets the requirement of paragraph 22(a) of the selected methodology /45/ and the monitoring plan in the PDD has ensured the emission reductions are claimed due to the fuel switch measure not on account of any other measures. As per para 124 of VVM version 1.2 /44/, DNV confirms that the monitoring plan are in accordance with the applied methodology /45/. The monitoring arrangements described in the monitoring plan are feasible within the project design and DNV considers the project participants are able to implement the monitoring plan.



#### 4.8 Algorithms and/or formulae used to determine emission Emissions

Details of direct and indirect emissions are adequately discussed and calculations and their derivative formulas are derived from internationally recognized IPCC standards. The GHG emissions considered are:

##### Baseline

The emission baseline is the current emissions of the facility expressed as emissions per unit of output. Baseline emissions is determined as follows, (baseline)

$$BE_y = EF_{BSL} * Q_{PJ,y}$$

Where:

$BE_y$  Baseline emissions in the project activity in year  $y$  (tCO<sub>2</sub>e)

$EF_{BSL}$  Emission factor for the baseline situation (tCO<sub>2</sub>/ tonne of production)

$Q_{PJ,y}$  Net energy output in the project activity in year  $y$  (tonne of production)

The net energy output in the project activity ( $Q_{PJ,y}$ ) in year  $y$  is limited to the capacity in the baseline scenario.

The emission factor in the baseline situation ( $EF_{BSL}$ ) is the coefficient for the fossil fuel used in the baseline expressed as emission per unit of output,

$$EF_{BSL} = \sum_{i,j} FC_{i,j,BL,y} * NCV_j * EF_{CO2,j} / Q_{BSL,j}$$

Where:

$EF_{BSL}$  Emission factor for the baseline situation (tCO<sub>2</sub>/tonne of glass)

$FC_{i,j,BL,y}$  Amount of the fuel type  $j$  (i.e. coal) consumed by the element process  $i$  during the year  $y$  operating at the baseline energy scenario (mass unit)

$NCV_j$  Net calorific value of the coal (kJ/unit)

$EF_{CO2,j}$  CO<sub>2</sub> Emission factor of the coal (tCO<sub>2</sub>/kJ)

For the  $FC_{i,j,BL,y}$ , the historical information on the use of coal and plant output in the baseline situation from the 3 years prior to the project implementation on 12 February 2007 (i.e. 2004, 2005, 2006) has been chosen in the calculation of baseline emissions. The data has been cross checked with the invoices issued by the coal supplier, Jie Xiu City Xiaoweigou Coal Supply Co., Ltd. /31/.

For the emission factor ( $EF_{CO2,j}$ ) of the coal used, the lower value of emission factor for the coal with the 95% confidence interval from the *IPCC Guidelines for National Greenhouse Gas Inventories* /50/ was chosen in the calculation of baseline emissions.

For the  $NCV_j$  of the coal used, it was sourced from the NCV certification report issued by the *Shanxi Coal Quality Measuring Center*, which is a qualified local third party /34/. Therefore, the data is deemed to be accurate and reliable and in line with the applied methodology.



$Q_{BSL,j}$  Net output generated in the element process in the baseline situation during the corresponding period of time for which the total fuel consumption was taken. The annual glass output in the baseline situation from 2004 - 2006 is chosen in the calculation of baseline emissions /32/. The data has been cross checked with the receipts /33/.

The  $EF_{BSL}$  is calculated to be 3.1138 tCO<sub>2</sub>/tonne of glass. The sources and calculation have been verified by DNV. The annual baseline output of glass is estimated to be 24 000 tonne per year /2/. Hence, the annual baseline emission of the proposed project are 74 732 tCO<sub>2</sub>e.

### Project activity emissions

Project activity emissions consist of those emissions related with the use of fossil fuel after the fuel switch. The project emissions are determined as follows,

$$PE_y = FC_y * EF_{CO2} * NCV$$

Where,

$PE_y$  Project emission in the project activity in year y (tCO<sub>2</sub>e)

$FC_y$  Amount of natural gas consumed for captive energy generation in the project activity in year y (volume)

$EF_{CO2}$  CO<sub>2</sub> emission factor for natural gas consumed by the project activity (tCO<sub>2</sub>/kJ).

$NCV$  Net calorific value for natural gas (kJ/unit)

The amount of natural gas consumed for output of glass by the project activity in the year y ( $FC_y$ ) will be continuously monitored. The estimated annual natural gas consumption (14 000 000 Nm<sup>3</sup>/year) from the FSR /2/ has been used to estimate the project emissions.

The CO<sub>2</sub> emission factor for natural gas ( $EF_{CO2}$ ) is one ex-ante parameter and chosen as the higher value with the 95% confidence interval from the *IPCC Guidelines for National Greenhouse Gas Inventories* (58.3 tCO<sub>2</sub>/TJ) /50/.

The NCV for natural gas consumed by the project activity will be monitored by the Qi county Jieyuan Natural Gas Co., Ltd. (36.12 MJ/Nm<sup>3</sup>) /35/. The estimated project emissions after the project implementation is calculated to be 29 481 tCO<sub>2</sub> per year.

### Leakage

As per the applied methodology AMS-III.B version 14 /45/, no leakage calculation is required.

### Emission Reductions

The emission reductions achieved by the project activity ( $ER_y$ ) will be calculated as the difference between the baseline emissions and the project emissions, as the formula below.

$$ER_y = BE_y - PE_y$$

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 45 251 tCO<sub>2</sub>e per year for the selected crediting period.

All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, including their references and sources. All documentation used by the



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

#### **4.9 Environmental impacts**

The environmental impacts are considered minor. The EIA of this project activity has been approved by Shanxi Qi County Environmental Protection Agency on 16 September 2006 /3/. Regarding to this project is a small scale fuel switching project activity, no significant environmental effects have been observed.

#### **4.10 Comments by local stakeholders**

The stakeholder consultation process has been conducted according to *Environmental Protection Law of the People's Republic of China* /54/. Besides the stakeholder consultation process stipulated in the Chinese EIA regulation in August 2006, the project developer has conducted an additional stakeholder consultation and carried out a survey of the potential stakeholders, including local residents and local government in the area using a questionnaire.

35 copies of questionnaire were distributed to local stakeholders and 30 questionnaires were answered giving the 86% responds rate /39/. DNV has checked all the questionnaires answered /39/. The survey shows that the proposed project received support from the local people. The summary of comments received from local stakeholders was properly described in the PDD version 4 dated 14 September 2011 /1/, with no negative opinion on this project.

DNV considers the local stakeholder consultation carried out adequately.

#### **4.11 Comments by Parties, stakeholders and NGOs**

The PDD version 2 dated 19 March 2009 /1/ was made publicly available on UNFCCC website /63/. Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period respectively from 5 September 2009 to 4 October 2009.

No comments were received.

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**APPENDIX A**

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**CDM VALIDATION PROTOCOL**

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

Requirement	Reference	Conclusion
<b>About Parties</b>		
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
<b>About additionality</b>		
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

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

Requirement	Reference	Conclusion
that would have occurred in the absence of the registered CDM project activity.		
<b>About forecast emission reductions and environmental impacts</b>		
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
<b>About small-scale project activities (if applicable)</b>		
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakech Accords and shall not be a debundled component of a larger project activity.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK
13. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and use the simplified baseline and monitoring methodology for that project category.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK
14. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK
<b>About stakeholder involvement</b>		
15. 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
16. 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
<b>Other</b>		
17. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
18. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
19. 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
20. Provisions for monitoring, verification and reporting shall be in accordance with	CDM Modalities and Procedures §37f	OK

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

Requirement	Reference	Conclusion
the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.		



**Table 2 Requirements checklist**

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

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

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				<p>analysis.</p> <p><input checked="" type="checkbox"/> The project is an individual small scale project activity with emission reductions not exceeding 15 000 tCO<sub>2</sub>e per year. In this case, DOE may not conduct a physical site visit as appropriate.</p> <p><input type="checkbox"/> Greenfield project</p> <p><i>How was the design of the project assessed?</i></p> <p><input checked="" type="checkbox"/> Physical site inspection</p> <p><input checked="" type="checkbox"/> Reviewing available designs and feasibility studies</p> <p><i>If a physical site inspection is not undertaken, justify why no site visit was undertaken:</i></p>		
A.2.2	If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/	DR	The proposed project does not involve any new facilities and thus can not be a Greenfield project.		OK
A.2.3	If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO <sub>2</sub> e per year), justify the sampling through a statistical analysis:	/1/	DR	It is not applicable for the proposed project activity since it is not a bundled small scale project.		OK
A.2.4	Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	/1/	DR	Yes, the description of the proposed CDM project activity as contained in the PDD has sufficiently covered all relevant elements, and is accurate and it provides the reader with a clear understanding of the nature of the proposed CDM project activity.		OK
A.2.5	Does the project activity involve alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/	DR	<p>Yes, the proposed project activity involves alteration of existing installations.</p> <p>The coal combustion devices installed before the pre-project activity will be dismantled and then</p>		OK

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				replaced with the natural gas combustion devices. The differences between pre-project and post-project activity have been described in the section 4.2 of PDD and illustrated in the Figure 2.		
A.2.6	Does the project design engineering reflect current good practices?	/1/	DR	The natural gas combustion and automatic control system are domestically manufactured by the Hebei Huixing Electric Co., Ltd., which has earned the mature technology in natural gas area. Therefore, it is considered by DNV that the project design reflects current good practices.		OK
A.2.7	Would the technology result in a significantly better performance than any commonly used technologies in the host country? Is any transfer of technology from any Annex-I Party involved?	/1/	DR	The technology adopted by the proposed project activity is mature and commonly used. No transfer of technology from any Annex-I Party has ever been identified.		OK
A.2.8	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/	DR	The annual emission reductions resulted from the proposed project activity is 45 251 tCO <sub>2</sub> e, which is within the eligibility limit of 60 ktCO <sub>2</sub> e annually. Therefore, the proposed project activity 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
A.2.9	Is the small scale project activity a debundled component of a larger project activity in accordance with the rules defined in appendix C of the simplified modalities and procedures for small-scale CDM project activities?	/1/	DR	Neither the proposed project is a debundled component of a larger project as there is no registered CDM project activity or other projects to apply for CDM registration with the same project participants, which is confirmed by DNV through visiting the project site and checking the CDM projects approved by the NDRC.		OK
<b>A.3</b>	<b>Participation requirements (VVM para 51-54, 125-127)</b>					
A.3.1	Do all participating Parties fulfil the participation	/1/	DR	Yes, the two participating Parties all fulfil the		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
requirements as follows:			following participation requirements.		
			China (host) United Kingdom of Great Britain and Northern Ireland Country Y		
a) Party has ratified the Kyoto Protocol	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
b) Party has designated a Designated National Authority	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
c) The assigned amount has been determined	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
A.3.2 Do the letters of approval meet the following requirements?	/1/ /42/ /43/	DR CC	Yes, the letters of approval from the both of participating Parties are provided to DNV and confirmed to have met the following requirements.		OK
			China (host) United Kingdom of Great Britain and Northern Ireland Country Y		OK
a) LoA confirms that Party has ratified the Kyoto Protocol	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
b) LoA confirms that participation is voluntary	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
c) The LoA confirms that the project contributes to the sustainable development of the host country?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	NA NA		
d) The LoA refers to the precise project activity title in the PDD	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
e) The LoA is unconditional with respect to (a) to (d) above	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
f) The LoA is issued by the respective Party's DNA	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
g) The LoA was received directly by the DNA or the PP	<input type="checkbox"/> DNA	<input checked="" type="checkbox"/> PP	<input type="checkbox"/> DNA <input checked="" type="checkbox"/> PP <input type="checkbox"/> DNA <input type="checkbox"/> 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	The authenticity of the LoA from the DNA of China has been verified through checking the link to China		The authenticity of the LoA from the United Kingdom of Great Britain and Northern Ireland has been verified		

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				CDM website, through checking the link to its DNA website, <a href="http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3576">http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3576</a> <a href="http://www.decc.gov.uk/assets/decc/what%20we%20do/global%20climate%20change%20and%20energy/tackling%20climate%20change/intl_strategy/mechanisms/clean_dev/1_20100527094605_e_@@_cdmukapprovedprojects.pdf">http://www.decc.gov.uk/assets/decc/what%20we%20do/global%20climate%20change%20and%20energy/tackling%20climate%20change/intl_strategy/mechanisms/clean_dev/1_20100527094605_e_@@_cdmukapprovedprojects.pdf</a>		
A.3.3	Have all private/public project participants been authorized by an involved Party?	/1/ /42/	DR CC	The participant, Shanxi Hongyi Glassware Co., Ltd., has been authorized by the DNA of host Party China.		OK
<b>A.4 Technical description of the project activity (VVM para 58-64)</b>						
A.4.1	Is the project's location clearly defined?	/1/ /2/	DR CC	Yes, the project is located in Xiliuzi Village, Qi County, Jinzhong City, Shanxi Province, P. R. China. And the proposed project has the geographical coordinates with E112°1'25" and N37°4'5". The location of the proposed project activity and its geographical coordinates have been clearly defined in the PDD, and verified to be correct against the FSR.		OK
<b>A.5 Public funding of the project activity</b>						
A.5.1	In case public funding from Parties included in Annex I is used for the project activity, have these Parties provided an affirmation that such funding does not result in a diversion of	/1/	DR	Therefore is no evidence to identify there are the public funding from Parties included in Annex I is used for the project activity.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
official development assistance and is separate from and is not counted towards the financial obligations of these Parties?					
<b>B Application of a baseline and monitoring methodology</b>					
<b>B.1 Methodology applied (VVM para 65-76 and VVM para 136 (b) for small-scale project activities, as applicable)</b>					
B.1.1 Does the project apply an approved methodology and the correct and valid version thereof?	/1/ /45/	DR	Yes, the project applies an approved methodology and the correct and valid version, i.e. AMS-III.B version 14.		OK
B.1.2 If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?	/1/ /46/ /51/	DR	Yes. The “General guidelines to SSC CDM methodologies” and “Information on additionality (Attachment A to Appendix B of 4/CMP.1 Annex II)” and “Acronyms, Abbreviations and units of Measure (Attachment B to Appendix B of 4/CMP.1 Annex II)” and “General Guidance on Leakage in biomass project activities (Attachment C to Appendix B of 4/CMP.1 Annex II)” provided by the CDM EB in respect to the applied methodology have been considered by the project participants.		OK
B.1.3 If the project applies a small-scale methodology, does the project also comply with the general guidelines to SSC CDM methodologies, which provides guidelines on equipment capacity, equipment performance/lifetime, baseline identification for type-II/III Greenfield project activities, sampling and other monitoring-related issues?	/1/	DR	The project applies a small-scale methodology, and it is confirmed by DNV that the project activity also complies with the general guidelines to SSC CDM methodologies.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<b>B.2 Applicability of methodology (and tools) (VVM para 65-76)</b> <i>Insert a row for each applicability criteria of the applied methodology (and tools)</i>					
<b>B.2.1</b> How was it validated that project complies with the following applicability criteria 1? This methodology comprises fossil fuel switching in industrial, residential, commercial, institutional or electricity generation applications (e.g., fuel switch from fuel oil to natural gas in an existing captive electricity generation or replacement of a fuel oil boiler by a natural gas boiler).	/1/	DR	The proposed project activity involves fossil fuel switching in industrial application (i.e. fuel switch from coal to natural gas in an existing production of glassware).		OK
<b>B.2.2</b> How was it validated that project complies with the following applicability criteria 2? Fuel switch may be in a single element process or may include several element processes within the facility. Multiple fossil fuel switching in an element process however is not covered under this methodology.	/1/	DR	Fuel switch of the proposed project only includes a single element process, i.e. from switching coal to natural gas.		OK
<b>B.2.3</b> How was it validated that project complies with the following applicability criteria 3? This methodology is applicable for new facilities as well as for retrofit or replacement of existing installations.	/1/	DR	The proposed project activity involves the replacement of existing installations.		OK
<b>B.2.4</b> How was it validated that project complies with the following applicability criteria 4? Fuel switching may also result in energy efficiency improvements. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this methodology. If fuel switching is part of a project activity focused primarily on energy efficiency, the project activity falls under a Type II methodology.	/1/	DR	The proposed project activity primarily aims at reducing emissions through fuel switching. The improvement to its energy efficiency is not expected.		OK
<b>B.2.5</b> How was it validated that project complies with the	/1/	DR	The proposed project activity is not a Greenfield		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<p>following applicability criteria 5?</p> <p>New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the General Guidance for SSC methodologies. The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the General Guidance for SSC methodologies. If the remaining lifetime of the affected systems increases due to the project activity, the crediting period shall be limited to the estimated remaining lifetime, i.e. the time when the affected systems would have been replaced in the absence of the project activity.</p>				<p>project and involves the replacement of equipments.</p> <p>No increase of the affected system due to the proposed project activity has been identified.</p>		
B.2.6	<p>How was it validated that project complies with the following applicability criteria 6?</p> <p>This methodology is not applicable to project activities that propose switch from fossil fuel use in the baseline to renewable biomass, biofuel or renewable energy in the project scenario.</p> <p>A relevant Type I methodology shall be used for such project activities that generate renewable energy displacing fossil fuel use. This methodology is also not applicable to project activities involving the use of waste gas; these project activities might be eligible under AMS-III.Q.</p>	/1/	DR	<p>The proposed project activity neither switches from fossil fuel to renewable energy, nor generates renewable energy displacing fossil fuel use.</p> <p>And the waste water has never been used by the project activity.</p>		OK
B.2.7	<p>How was it validated that project complies with the following applicability criteria 7?</p> <p>The facility may involve grid connected elemental processes however this methodology does not cover emission reductions on account of shift from use of grid electricity.</p>	/1/	DR	<p>The proposed project activity results in the emission reductions through fuel switch from coal to natural gas, and does not take into the account of the use of grid electricity.</p>		OK
B.2.8	<p>How was it validated that project complies with the following applicability criteria 8?</p> <p>This category is applicable to project activities where it is</p>	/1/	DR	<p>The energy consumption (i.e. natural gas) and output (i.e. glassware) will be directly measured and recorded within the project boundary.</p>		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
possible to directly measure and record the energy use/output (e.g., heat and electricity) and consumption (e.g., fossil fuel) within the project boundary.						
B.2.9	How was it validated that project complies with the following applicability criteria 9? Heat or electricity produced under the project activity shall be for on-site captive use and/or export to other facilities included in the project boundary. In case energy produced by the project activity is delivered to another facility, or facilities, within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into specifying that only the facility generating the energy can claim emission reductions from the energy displacement..	/1/	DR	The heat produced under the project activity will be for on-site captive use to produce the glass. It will not be exported to any other facilities.		OK
B.2.10	How was it validated that project complies with the following applicability criteria 10? Regulations do not constrain the facility from using the energy sources cited in paragraph 1 before or after the fuel switch. Regulations do not require the use of low carbon energy source (e.g., natural gas or any other fuel) in the element processes.	/1/	DR	There is verified to be no regulations constrain the facility from using the coal or natural gas. No regulations require the use of low carbon energy, like natural gas in the element processes.		OK
B.2.11	How was it validated that project complies with the following applicability criteria 11? The project activity does not result in integrated process change. The purpose is to exclude measures that affect other characteristics of the process besides switch of energy sources e.g., operational conditions, type of raw material processed, use of non-energy additives, change in	/1/	DR	Besides switch of energy sources, the project activity does not result in integrated process change.		OK

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type or quality of products manufactured etc.						
B.2.12	How was it validated that project complies with the following applicability criteria 12? Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO <sub>2</sub> equivalent annually.	/1/	DR	The proposed project activity will result in emission reductions of 45 251 tCO <sub>2</sub> e per year, which is less than 60 kt CO <sub>2</sub> e annual.		OK
B.2.13	Is the selected baseline on of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/	DR	Yes, the selected baseline by the proposed project activity is to consume the coal as fuel to power the glassware kilns as expressed as emissions per tonne of glassware.  It is the baseline described in the methodology and this thus confirms the applicability of the methodology.		OK
<b>B.3 Project boundary (VVM para 78-80)</b>						
B.3.1	What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/ /45/	DR	The project's system boundary includes the combustion devices (where the switch of energy source takes place) and two glass kilns (affected equipment due to the project activity).  It has been clearly defined in the PDD and verified to comply with the methodology.		OK
B.3.2	Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/1/ /45/	DR I	The GHG source identified for the proposed project activity is CO <sub>2</sub> .  Yes, the identified boundary covers all possible sources linked to the project activity.  The identified boundary and selected sources and gases are justified for the project activity. 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		OK

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			more than 1% of the overall expected average annual emission reduction, which are not addressed by AMS-III.B (version 14).		
B.3.3 Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/1/	DR	No, the proposed project activity does not involve any other emission sources not foreseen by the methodologies that may question the applicability of the methodology.		OK
<b>B.4 Baseline scenario determination (VVM para 81-88, 105-107)</b> <i>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.</i>					
B.4.1 Which baseline scenarios have been identified? Is the list of baseline scenarios complete?	/1/ /44/	DR	<p>As per the methodology of AMS-III.B. Version 14, the baseline scenario is the continuance of current practice, i.e. using the coal as fuel.</p> <p>As per the paragraph 104 of the VVM version 1.2, if the approved methodology that is selected by the proposed project prescribes the baseline scenario, no further analysis for the creditable alternatives to the project activity is required.</p> <p>Thus, identification of alternatives to the project activity to determine the most realistic baseline scenario is not applied by the proposed project</p>		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				activity.		
B.4.2	How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR	It is not applicable as the proposed project is a small-scale project activity and the baseline scenario is determined directly as per the methodology selected by the project activity.		OK
B.4.3	What is the baseline scenario?	/1/	DR	The baseline scenario is the continuance of current practice, i.e. using the fuel coal for the thermal generation.		OK
B.4.4	Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/ /45/	DR	Yes. The determination of the baseline scenario is in accordance with the guidance in the methodology AMS-III.B version 14.		OK
B.4.5	Has the baseline scenario been determined using conservative assumptions where possible?	/1/ /45/	DR	It is not applicable as the proposed project is a small-scale project activity and the baseline scenario is directly determined as per the methodology AMS-III.B version 14 selected by the project activity.		OK
B.4.6	Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/ /45/	DR	It is not applicable as the proposed project is a small-scale project activity and the baseline scenario is directly determined as per the methodology AMS-III.B version 14 selected by the project activity.		OK
B.4.7	Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/ /45/	DR	It is not applicable as the proposed project is a small-scale project activity and the baseline scenario is directly determined as per the methodology AMS-III.B version 14 selected by the project activity.		OK
B.4.8	Is the baseline determination adequately documented in the PDD? <ul style="list-style-type: none"> <li>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</li> </ul>	/1/ /45/	DR	The baseline determination has been adequately documented in the PDD version 4 dated 14 September 2011, <ul style="list-style-type: none"> <li>Not applicable</li> <li>Not applicable</li> </ul>		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<p>referenced.</p> <ul style="list-style-type: none"> <li>All documentation is relevant as well as correctly quoted and interpreted.</li> <li>Assumptions and data can be deemed reasonable</li> <li>Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.</li> <li>The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity</li> </ul>			<ul style="list-style-type: none"> <li>Not applicable</li> <li>Not applicable</li> </ul> <p>The methodology AMS-III.B version 14 has been correctly applied to identify what would occur in the absence of the proposed CDM project activity.</p>		
<b>B.5 Additionality determination (VVM para 94-121 and VVM para 137 for small-scale project activities, as applicable)</b>					
B.5.1 What approach/tool does the project use to assess additionality? Is this in line with the methodology? <i>In case of small-scale CDM project activities, is Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities applied considering also the “Non-binding best practice examples to demonstrate additionality for SSC project activities”.</i>	/1/ /45/ /46/	DR	<p>The additionality of the proposed project activity is assessed by applying the Attachment A of Appendix B of the <i>Simplified Modalities and Procedures for Small-scale CDM Project Activities</i>.</p> <p>It is in line with the applied methodology AMS-III.B Version14.</p>		OK
B.5.2 Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR	The regulatory requirements have been correctly taken into account in accessing the project activity and the alternatives.		OK
B.5.3 Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	To assess the additionality of the proposed project activity, sufficient evidences have been provided.		OK
B.5.4 What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/	DR	The project additionality is based on investment analysis.		OK
<b>Prior consideration of CDM (VVM para 98-103)</b>					
B.5.5 What is the evidence for serious consideration of CDM prior to the time of decision to proceed with the project activity?	/1/ /2/	DR CC	The decision to proceed with the project activity was made on 10 February 2007 when the earliest		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	/8/ /9/		<p>financial decision, i.e. signing the <i>Engineering procurement and construction contract</i>, was made.</p> <ul style="list-style-type: none"> <li>⊕ In June 2006, the FSR was finished by the third party, where it is clearly indicated that the project has less financial attractiveness.</li> <li>⊕ In order to make the project financially feasible, the project owner held the board meeting on 16 November 2006 to decide to proceed with the project activity as a CDM project.</li> <li>⊕ On 16 November 2006, the project owner signed the CDM Consultation Agreement with Shanxi Huaaoda Green Industry Development Co., Ltd.</li> </ul> <p>Based on the issues listed above, the awareness of CDM prior to the project activity start date has been substantiated, and the benefit of CDM was a decisive factor in the decision to proceed with the project activity.</p> <p>As per the annex 22 EB 49, since the proposed project activity has the starting date before 2 August 2008, the project participants must indicate, by the means of reliable evidence, that continuing and real actions were taken to secure the CDM status for the project in parallel with its implementation.</p>		
B.5.6 If the starting date is after 2 August 2008 and before the global stakeholder consultation, has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM status?	/1/ /9/	DR	It is not applicable to the project activity, as the project starting date (10 February 2007) is prior to 2 August 2008.		OK

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<b>Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)</b>					
B.5.7 What initiatives were 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/ /20/ /21/ /22/ /23/ /24/	DR CC	<p>As per the annex 22 EB 49, since the proposed project activity has the starting date before 2 August 2008, the project participants must indicate, by the means of reliable evidence, that continuing and real actions were taken to secure the CDM status for the project in parallel with its implementation.</p> <p>The initiatives taken by the project participants from the starting date of the project activity to the start of validation are shown as below,</p> <ul style="list-style-type: none"> <li>⊕ The project participants contracted with the CDM consultant to complete the CDM application.</li> <li>⊕ CDM training meetings for the related staff working in the Shanxi Hongyi Glassware Co., Ltd. in September and December 2007.</li> <li>⊕ Meetings to discuss the methodology and PDD drafting were held in March and July 2008.</li> <li>⊕ Emission Reductions Purchase Agreement was signed in October 2008</li> </ul> <p>Submitted the PDD to HNA on 20 February 2009</p>		OK
B.5.8 When did the construction of the project activity start?	/1/ /9/ /22/ /60/	DR CC I	<p>The Engineering procurement and construction contract for the proposed project activity was signed on 10 February 2007.</p> <p>The construction commencement was issued by the supervision company on 12 February 2007.</p> <p>The construction of the project activity was substantiated to start on 12 February 2007.</p>		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.9	When was the project commissioned?	/1/	DR	The project activity was commissioned in July 2008.		OK
B.5.10	Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/1/ /11/ /13/ /20/	DR CC	<p>The continuous actions were taken to secure the CDM status for the project in parallel with its implementation have been confirmed through the following timeline,</p> <ul style="list-style-type: none"> <li>⊕ The project participants contracted with the CDM consultant to complete the CDM application on 23 June 2007.</li> <li>⊕ CDM training meetings for the related staff working in the Shanxi Hongyi Glassware Co., Ltd. in September and December 2007.</li> <li>⊕ Natural gas supply agreement was signed between the project owner and Qixian Haoyuan Natural Gas Co., Ltd. on 17 January 2008.</li> <li>⊕ Meetings to discuss the methodology and PDD drafting were held in March and July 2008.</li> <li>⊕ Emission reductions purchase agreement for the proposed project activity was signed in October 2008</li> <li>⊕ Submitted the PDD to DNA of China's on 20 February 2009</li> </ul>		OK
<b>Investment analysis (VVM para 108-114)</b> <i>The list of questions below must be adjusted to the parameters in the investment analysis relevant to the project under validation.</i>						
B.5.11	Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/1/	DR	The project activity does not generate revenues apart from CDM, which has been reflected in the PDD.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.12	Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR	It is not applicable since there are no alternatives to the project activity identified in the PDD.		OK
B.5.13	Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	The proposed project activity does not generate any financial or economic benefits other than the CDM related revenues, so the simple cost analysis is selected.		OK
B.5.14	Is the benchmark/discount rate the latest available at the time of decision?	/1/ /56/	DR CC	In line with the <i>Methods and Parameters for Economic Assessment of Construction Projects (version 3)</i> in China, the investment benchmark of 12% Internal Rate of Return (IRR) applicable for glass industry has been selected as the discount rate for the project activity. This discount rate is widely used by Chinese authorities for assessing the financial viability of potential new projects, and it deemed to be reasonable and appropriate for this project activity. And this rate is available value to use at the time of decision. The discount rate of 12% is used in both the alternatives and additionality is being demonstrated by the investment comparison.		OK
B.5.15	What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/	DR	The financial indicator is the net present value (NPV). It is on project basis and after tax. The financial indicator NPV is in correspondence with the benchmark.		OK
B.5.16	Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/1/	DR	The underlying assumptions are appropriate. No waste was considered in the baseline.		OK
B.5.17	Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/1/ /57/ /58/	DR CC	The tax calculation does not take the depreciation into the account.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.18 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/ /60/	DR CC	The time period of investment analysis is 25 years, consisting of 25 years operation period. The time period of investment analysis and operation time of the project has been verified to be in line with the “Rules of Construction Project Quality Control” and thus deemed to be realistic. No working capital has been applied in the investment analysis of the proposed project activity.		OK
B.5.19 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/	DR CC	The input parameters used in the financial analysis are taken from the feasibility study report (FSR) developed by a qualified third party and approved by the Shanxi Qi County Planning Commission in 16 August 2006. Information contained in the FSR, can thus be considered information provided by an independent and recognized source.  DNV compared the input parameters for the financial analysis included in the PDD with the parameters stated in the FSR and was able to confirm that the values applied are consistent with the value stated in the FSR.  The FSR of the proposed project activity was approved in 16 August 2006 and thus only six months prior to the decision to proceed with the project activity (i.e. the start date of the project) which was on 10 February 2007. Given this relatively short period of time between the approval of 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 it is thus reasonable		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			to assume that the FSR has been the basis of the decision to proceed with the investment in the project.		
B.5.20 How was the amount of output (e.g. sales of electricity) assessed? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /2/	DR	<input type="checkbox"/> 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 <input type="checkbox"/> The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) <input checked="" type="checkbox"/> Other approach. <i>Provide details on how the load factor was validated::</i> The amount of glass produced annually is 24 000 tonne per year. It is the total installed capacity of two glass kilns (one with the installed capacity of 2 000 tonne and another one with the installed capacity of 22 000 tonne).		OK
B.5.21 How was the output price (e.g. electricity price) assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/2/ /13/ /16/ /17/ /18/	DR	<input checked="" type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices) <input checked="" type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants <i>Provide details on how the output price was validated:</i> The natural gas price as 2.3 RMB/Nm <sup>3</sup> is agreed upon the gas supply agreement, which has been verified through the invoice of purchasing the natural gas. Furthermore, according to the "Notice on the prices of natural gas in Jinzhong		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>City”, the price for the natural gas (use for industry) is 2.4 RMB/Nm<sup>3</sup>. Therefore, DNV confirms that price for natural gas has been cross checked to be reasonable.</p> <p>The coal price of 385 RMB/tonne adopted by the proposed project activity, was taken from the invoice of purchasing coal in January 2007. It was the most recent coal price before the investment decision on 10 February 2007. The proof to demonstrate the prices in 2008 and 2009 from the same coal supplier Zhangjiagang Dongfeng Special Blower-Fan Co., Ltd., has been verified by DNV. Based on the proof, it is identified that the coal prices in 2008 and 2009 are respectively 415 RMB/tonne and 398 RMB/tonne. Given the coal price trend in the period 2007 to 2009, DNV considers that the estimated coal price used in the NPV analysis is suitable.</p>		
B.5.22 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/ /2/ /7/ /9/ /26/ /27/ /28/	DR CC	<p><input checked="" type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices)</p> <p><input checked="" type="checkbox"/> Review of feasibility reports, public announcements, contracts and annual financial reports related to the project and the project participants</p> <p><i>Provide details on how the investment costs were validated:</i></p> <p>The project total static investment (4.968 million RMB) is sourced from the FSR. DNV has verified the purchase agreements as well as other relevant contracts and documents for construction</p>		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			related services, and is able to conclude that the total contracted expenses is 4.6866 million RMB. The total contracted value accounts for the 94.33% of the total static investment (4.968 million RMB) as estimated in the FSR. Therefore, the total static investment applied in the financial analysis of the project activity is considered to be appropriate at the time of investment decision.		
B.5.23 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 used for cross-checking in accordance with VVM paragraph 95.	/1/ /2/ /4/ /59/ /37/ /38/	DR CC	<input checked="" type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices) <input type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants <i>Provide details on how the O&amp;M costs were validated:</i> <u>Fuel operation cost of coal</u> <p>The fuel operation cost of coal (547 RMB/tonne) is sourced from the FSR. The annual fuel operation cost of coal is equal to the coal price (385 RMB/tonne) multiplied by the fuel consumption ratio of coal (1.42). The fuel consumption rate of coal (1.42) is sourced from the FSR.</p> <p>To further validate the appropriateness of fuel operation costs, the average weighted value of fuel consumption ratio in the three years prior to the implementation of project activity (i.e. the years 2004, 2005 and 2006) is calculated to be 1.42 tonne per tonne of glass production, which is consistent with the value estimated in the FSR.</p>		OK

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			<p>DNV has also verified from the statistics made by the China glass association, the fuel consumption ratio of coal varies from 1.32 to 1.52 tonne per tonne of glass production in China. The fuel consumption ratio of coal adopted by this project is validated to be within the range. Therefore, the fuel consumption ratio is confirmed by DNV to be valid and applicable at the time of investment decision.</p> <p><u>Fuel operation cost of natural gas</u></p> <p>The fuel operation costs of natural gas (1 341 RMB/tonne of glass) is sourced from the FSR. It is equal to the natural gas price (2.3 RMB/Nm<sup>3</sup>) multiplied by the fuel consumption ratio of natural gas (583 Nm<sup>3</sup> per tonne of glass).</p> <p>The fuel consumption ratio of natural gas (583 Nm<sup>3</sup> per tonne of glass) is sourced from the FSR. The appropriateness of fuel consumption ratio of natural gas is justified through comparing with the experienced range. According to the statistics made by the China glass association, the fuel consumption rate of coal glass kiln ranges from 545 to 620 Nm<sup>3</sup> per tonne of glass production in China. The value used by the project activity at 583 Nm<sup>3</sup> per tonne of glass, is validated to be within this range. Furthermore, the aggregated actual consumption ratio for natural gas from July 2008 to December 2010 is calculated to be 584 Nm<sup>3</sup> per tonne of glass, on the basis of the invoices of monthly natural gas consumption and monthly statistics of glass production. Its</p>		

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			difference from the estimated value is slight, thus the consumption rate of natural gas applied by this project activity is deemed to be appropriate.		
B.5.24 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/ /2/ /57/	DR CC	<input checked="" type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices) <input checked="" type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants <i>Provide details on how other input parameters were validated:</i> <b>(a) VAT rate</b> VAT is a tax that applies to most business transactions involving the transfer of goods and services. It is thus applicable to the proposed project. When the business is registered for VAT, it will pay VAT on its purchase of equipments and charge VAT on its sales. The VAT rate applied by the proposed project activity is 17%, which is verified to be in line with <i>Notice on the value added tax, issued by the Ministry of Finance and State Administration of Taxation</i> , [1994] No.4. The document ([1994] No.4) was still valid at the time of investment decision on 10 February 2007. <b>(b) Rate of Enterprise Income Tax</b> According to the <i>Provisional Regulation of the People's Republic of China on Enterprise Income Tax</i> , the enterprise income tax shall be levied at the rate of 33%. The rate of income tax (33%)		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				applied in the financial analysis is derived from the FSR, which is in line with the <i>Provisional Regulations of the People's Republic of China on Enterprise Income Tax</i> , issued by the State Council, State Council No.137. The document (State Council No.137) was still valid at the time of making investment decision on 10 February 2007.		
B.5.25	Was the financial calculation spreadsheet verified and found to be correct?	/1/ /4/	DR	The financial calculation spreadsheet was verified and found to be correct.		OK
B.5.26	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/ /4/	DR	Yes, the key parameters contributing to more than 20% of the revenue/costs during operating or implementation have been identified in the PDD.		OK
B.5.27	Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/ /2/ /4/ /14/ /15/ /16/ /17/ /18/ /19/	DR CC	<p>Static Total Investment: DNV was able to confirm that the reduction by 100% in investment costs is unlikely to happen. Even the total static investment is 100% removed, the NPV of the proposed project activity is still negative.</p> <p>Price of natural gas: For a 60.98% decrease in the price of natural gas, the project NPV will be zero. According to the FSR completed by a qualified design and research institute, the price of natural gas is 2.3 RMB/Nm<sup>3</sup>. According to the invoices of purchasing the natural gas, the price of natural gas has been increasing from 2007 to 2010. Therefore, it is highly unlikely to decrease the price of natural gas by 60.98% during the whole crediting period.</p> <p>Coal price: For a 149.57% increase in the price of</p>		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			coal, the NPV will become positive. The price of coal adopted by the project activity is verified to be in line with the invoices in January 2007. Referring to the proof from the coal supplier, the coal price has been remains in the stable trend with the range from 385 ~ 415 RMB/tonne. Therefore, it is not possibly to increase the coal price by 149.57%.		
B.5.28 Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/1/ /4/	DR	The key parameters have been varied to reach the benchmark and the likelihood of this to happen been justified to be small.		OK
<b>Conclusion</b>					
B.5.29 What is the conclusion with regard to the additionality of the project activity?	/1/	DR	Based on the discussion above, it has been concluded that the proposed project activity is additional.		OK
<b>B.6 Calculations of GHG emission reductions</b>					
<b>Data and parameters that are available at validation and that are not monitored (VVM para 199-203)</b>					
B.6.1 How was the $Q_{BSL,j}$ available at validation verified?	/1/	DR	$Q_{PJ,y}$ : The heat output in the project activity in the baseline situation.  Net output generated in the element process in the baseline situation during the corresponding period of time for which the total fuel consumption was taken. The annual glass output in the baseline situation from 2004 - 2006 is chosen in the calculation of baseline emissions. The data has been cross checked with the receipts.		OK
B.6.2 How was the $EF_{BSL}$ available at validation verified?	/1/	DR	The emission factor in the baseline situation ( $EF_{BSL}$ ) is the coefficient for the fossil fuel used		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	/31/ /32/ /33/ /34/ /53/		<p>in the baseline expressed as emission per unit of output,</p> $EF_{BSL} = FC_{i,j,BL,y} * EF_{CO2,j} * NCV_j / Q_{BSL,j}$ <p>Where:</p> <p><math>EF_{BSL}</math> Emission factor for the baseline situation (tCO<sub>2</sub>/tonne of output)</p> <p><math>FC_{i,j,BL,y}</math> Amount of natural gas consumed by the element process during the year y operating at the baseline energy scenario (mass unit)</p> <p><math>NCV_j</math> Net calorific value of the fuel coal (kJ/unit)</p> <p><math>EF_{CO2,j}</math> CO<sub>2</sub> Emission factor of the fuel type coal (tCO<sub>2</sub>/kJ)</p> <p>For the <math>FC_{i,j,BL,y}</math>, the historical information on the use of coal and plant output in the baseline situation from the 3 years prior to the project implementation on 10 February 2007 (i.e. 2004, 2005, 2006) has been chosen in the calculation of baseline emissions. The data has been cross checked with the invoices issued by the coal supplier, Jie Xiu City Xiaoweigou Coal Supply Co., Ltd..</p> <p>For the emission factor ( <math>EF_{CO2,j}</math> ) of the coal used, the lower value of emission factor for the coal with the 95% confidence interval from the</p>		

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p><i>IPCC Guidelines for National Greenhouse Gas Inventories</i> was chosen in the calculation of baseline emissions.</p> <p>For <math>NCV_j</math>, it was sourced from the NCV certification report issued by the <i>Shanxi Coal Quality Measuring Center</i>, which is a qualified local third party. Therefore, the data is deemed to be accurate and reliable and in line with the applied methodology.</p> <p><math>Q_{BSL,j}</math> Net output generated in the element process in the baseline situation during the corresponding period of time for which the total fuel consumption was taken. The annual glass output in the baseline situation from 2004 - 2006 is chosen in the calculation of baseline emissions. The data has been cross checked with the receipts.</p> <p>The <math>EF_{BSL}</math> is calculated to be 3.1138 tCO<sub>2</sub>/tonne of glass.</p>		
B.6.3 How was the $FC_{i,j,BL,y}$ available at validation verified?	/1/ /32/ /30/ /33/ /31/	DR	$FC_{i,j,BL,y}$ : Amount of fuel coal consumed by the element process during the year $y$ operating at the baseline scenario. It is taken from the historical coal consumption data kept by the project owner. And it has been cross checked with the invoices of coal from the coal supplier.		OK
B.6.4 How was the $NCV_j$ available at validation verified?	/1/ /34/	DR	$NCV_j$ : Net calorific value of the fuel coal (kJ/unit).		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				For the $NCV_j$ of the coal used, it was sourced from the NCV certification report issued by the <i>Shanxi Coal Quality Measuring Center</i> , which is a qualified local third party. Therefore, the data is deemed to be accurate and reliable and in line with the applied methodology.		
B.6.5	How was the $EF_{CO_2}$ and $EF_{CO_2,j}$ available at validation verified?	/1/ /53/	DR	$EF_{CO_2,j}$ : CO <sub>2</sub> emission factor of the fuel type j (tCO <sub>2</sub> /kJ)  The emission factor of coal and natural gas is sourced from the <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i> .		OK
B.6.6	How was the $EF_{CO_2}$ and $EF_{CO_2,j}$ available at validation verified?	/1/ /53/	DR	<ul style="list-style-type: none"> <li>For the emission factor (<math>EF_{CO_2,j}</math>) of the coal used, the lower value of emission factor for the coal with the 95% confidence interval from the <i>IPCC Guidelines for National Greenhouse Gas Inventories</i> was chosen in the calculation of baseline emissions.</li> <li>The CO<sub>2</sub> emission factor for natural gas (<math>EF_{CO_2}</math>) is one ex-ante parameter and chosen as the higher value with the 95% confidence interval from the <i>IPCC Guidelines for National Greenhouse Gas Inventories</i> (58.3 tCO<sub>2</sub>/TJ).</li> </ul>		OK
<b>Baseline emissions (VVM para 89-93)</b>						
B.6.7	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /5/ /45/	DR	The documented calculations of baseline emissions are according to the approved methodology AMS-III.B Version 14 and in a complete and transparent manner.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.6.8	Have conservative assumptions been used when calculating the baseline emissions?	/1/ /5/ /45/	DR	Yes, all the used assumptions are in line with the Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories-Type III.B. - Switching fossil fuels AMS-III.B Version 14.		OK
B.6.9	Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	There are no uncertainties identified in the baseline emission estimates.		OK
<b>Project emissions (VVM para 89-93)</b>						
B.6.10	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /5/ /45/	DR	The emission reduction calculation process has been transparently documented in EF calculation spreadsheet /5/.		OK
B.6.11	Have conservative assumptions been used when calculating the project emissions?	/1/ /5/ /45/	DR	Yes, all the used assumptions are in line with the Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories-Type III.B. - Switching fossil fuels AMS-III.B Version 14.		OK
B.6.12	Are uncertainties in the project emission estimates properly addressed?	/1/ /45/	DR	There are no uncertainties identified in the project emission estimates.		OK
<b>Leakage (VVM para 89-93)</b>						
B.6.13	Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /45/	DR	According to the approved methodology AMS-III.B Version 14, no leakage calculations are required.		OK
B.6.14	Have conservative assumptions been used when calculating the leakage emissions?	/1/ /45/	DR	According to the approved methodology AMS-III.B Version 14, no leakage calculations are required.		OK
B.6.15	Are uncertainties in the leakage emission estimates properly addressed?	/1/ /45/	DR	According to the approved methodology AMS-III.B Version 14, no leakage calculations are required.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<b>Emission Reductions (VVM para 89-93)</b>						
B.6.16	Algorithms and/or formulae used to determine emission reductions: <ul style="list-style-type: none"> <li>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</li> <li>All documentation is correctly quoted and interpreted.</li> <li>All values used can be deemed reasonable in the context of the project activity</li> <li>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.</li> </ul>	/1/ /32/ /30/ /33/ /31/ /53/	DR CC	The algorithms and/or formulae have been correctly used to determine emission reductions: <ul style="list-style-type: none"> <li>All data in the PDD used to determine the calculation are from the IPCC 2006, annual report of coal consumption, annual report of output of glass and other reference document. The data are properly referenced.</li> <li>According to the reference list, all documents of the calculations were correctly quoted and interpreted.</li> <li>All values used are deemed reasonable in the context of the bundled project activities because all values are either derived from the public national or IPCC data available or the PDR which can be considered information provided by a trustworthy and recognized source.</li> <li>The approved baseline and monitoring methodology AMS-III.B version 14 as well as its guidances have been correctly applied to calculate the emission reductions. And the emission reductions can be replicated by using the data and parameter provided in the PDD and supporting files submitted for registration. The data sources mentioned have been verified by DNV.</li> </ul>		OK
<b>B.7 Monitoring plan (VVM para 122-124)</b>						
<b>Data and parameters monitored</b>						
B.7.1	Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/	DR	Yes. The means of monitoring described in the plan complies with the requirements of the		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				methodology.		
B.7.2	Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	The monitoring plan in the PDD version 4 dated 14 September 2011 contains the necessary parameters to be monitored. The data unit, source of data, measurement procedures, monitoring frequency, QA/QC procedures of the monitored parameters have been clearly described.		OK
B.7.3	In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR	Yes, the measurement equipment for relevant parameter has been described in the PDD version 4 dated 14 September 2011. FC <sub>y</sub> , Natural gas consumed in the project boiler at the year y, will be monitored by the meters installed at the gateway of the glass plant. Q <sub>PI,y</sub> production of glassware in the year y, will be monitored through the balance scale and platform scale. NCV, net calorific value of natural gas. It will be measured by the NG supplier.		OK
B.7.4	In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	Yes, the accuracy levels for the measurement equipments have been described in the PDD version 4 dated 14 September 2011. The accuracy of the two natural gas meters will be 1.5 grades, which is verified to be in line with the <i>Measurement of gas flow in closed conduits-Turbine meters</i> . The accuracy levels of Balance Scale and platform Scale respectively are 1g and 200g.		OK
B.7.5	In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant	/1/	DR	The meters to measure the volume of natural gas, will be calibrated once a year by the certified body.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
parameter.				The balance scale and platform scale to weight the glass output, will be calibrated once a year by a certified body.		
B.7.6	Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	The FC <sub>y</sub> will be monthly monitored; The Q <sub>PJ, y</sub> will be daily monitored; The NCV will be monitored by the natural gas supplier, Qi county Jieyuan Natural Gas Co., Ltd..		OK
B.7.7	Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	The FC <sub>y</sub> will be recorded on a monthly basis; the Q <sub>PJ, y</sub> will be recorded on a monthly basis; The NCV will be recorded every two weeks.		OK
<b>Ability of project participants to implement monitoring plan</b>						
B.7.8	How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/ /25/	DR CC	The project's monitoring plan includes: <ul style="list-style-type: none"> <li>- A description of the responsibilities and authorities for project management;</li> <li>- Responsibility;</li> <li>- Reporting;</li> <li>- Calibration;</li> <li>- Error Handling Procedure</li> <li>- External Reporting Procedure</li> <li>- Procedure for corrective actions arising</li> <li>- Training</li> <li>- Data management system.</li> </ul> Detailed procedures have been elaborated in the PDD version 4 dated 14 September 2011 and project monitoring and operation manual. These will be maintained and implemented to		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			enable subsequent verification of emission reductions. The application of the monitoring methodology is transparent and DNV considers the project participants able to implement the monitoring plan.		
B.7.9 Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/1/		Yes. The procedures for day-to-day records handling have been identified in the PDD.		OK
B.7.10 Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/1/	DR	Yes. The detailed procedures related to data management, quality assurance and quality control have been elaborated in the PDD version 4 dated 14 September 2011. The relevant information will be maintained and presented to the verification agency or DOE for the verification of emission reductions.		OK
B.7.11 Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR	Yes. As described in the PDD version 4 dated 14 September 2011, all parameters monitored under the monitoring plan will be archived electronically and be kept at least for 2 years after the end of last crediting period.		OK
<b>Monitoring of sustainable development indicators/ environmental impacts</b>					
B.7.12 Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR	China legislation authorities do not require the collection and archiving of relevant data concerning sustainable development indicators. The monitoring of environmental impacts is conducted by the local environmental authority.		OK
B.7.13 Does the monitoring plan provide for the collection and	/1/	DR	Neither Chinese legislation authorities nor the		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
archiving of relevant data concerning environmental, social and economic impacts?				methodology requires any collection and archiving of data related to environmental, social and environmental impacts.		
B.7.14	Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR	Monitoring of sustainable development indicators, namely environmental, social and economic are in line with national priorities in China.		OK
<b>C Duration of the project activity / crediting period</b>						
<b>C.1.1 Start date of project activity (VVM para 99-100, 104)</b>						
C.1.2	How has the starting date of the project activity been determined? What are the dates of the first contracts for the project activity? When was the first construction activity?	/1/ /9/ /22/ /29/	DR CC	The engineering procurement and construction contract of the proposed project was signed on 10 February 2007. The construction commencement was signed on 12 February 2007. The purchase agreement of blowers for the proposed project activity was signed on 3 April 2007. Therefore, the date was verified to be the time when the earliest financial commitment was made, and therefore determined as the project starting date. The engineering procurement and construction contract signed on 10 February 2007 was taken as the first construction activity.		OK
C.1.3	Is the stated expected operational lifetime of the project activity reasonable?	/1/ /2/ /61/	DR CC	The expected operation lifetime of the proposed project activity is 25 years, which is sourced from the FSR. It has been determined by the FSR designer Shanxi Guoyang Investment Consulting Co., Ltd. and verified to comply with the <i>Rules of Construction projects Quality Control</i> issued by the State Council.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
C.1.4 Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR	A renewable crediting period is selected, and the first 7 years crediting period starts on 1 July 2011 (or the date of registration, whichever is later), which is deemed to be reasonable.		OK
<b>D Environmental Impacts (VVM para 131-133 and VVM para 136 (d) for small-scale project activities, as applicable))</b>					
D.1.1 Are there any host country requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved? Does the approval contain any conditions that need monitoring? <i>For small-scale project activities, is an assessment of the environmental impacts of the proposed CDM project activity is required by the host Party?</i>	/1/ /3/ /54/ /55/	DR CC	<p>The <i>Law of the People's Republic of China on Evaluation of Environmental Effects</i> was issued on 28 October 2002 and requires the EIA for the construction project.</p> <p>The EIA registration form for the proposed project activity from Shanxi Qi County Environmental Protection Agency has been issued on 16 September 2006.</p> <p>The EIA registration form does not contain any indicators to be monitored.</p> <p>For the proposed small-scale project activity, the assessment of the environmental impacts is required by the host party.</p>		OK
D.1.2 Does the project comply with environmental legislation in the host country?	/1/ /54/ /55/	DR CC	Yes. The project complies with the <i>Law of the People's Republic of China on Evaluation of Environmental Effects</i> since it has been approved by the local Environmental Protection Bureau.		OK
D.1.3 Will the project create any adverse environmental effects?	/1/ /2/	DR CC	According the EIA and its approval, the proposed project will cause no significant adverse impacts on the environment.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
D.1.4 Have identified environmental impacts been addressed in the project design?	/1/	DR	Yes. The identified environmental impact has been addressed in the PDD.		OK
<b>E Stakeholder Comments (VVM para 128-130)</b>					
E.1.1 Have relevant stakeholders been consulted?	/1/	DR	<p>In August 2006, the project owner of the proposed project carried out a survey of the local residents by the means of distributing questionnaires.</p> <p>The questionnaires were distributed to the local residents in the nearby areas of the proposed project. The investigated local stakeholders mainly live near the project site and were selected from different genders, ages and education levels with proper proportion.</p> <p>During the survey, 35 copies of questionnaires for the proposed project were distributed to local stakeholders and 30 answered questionnaires for the proposed project were returned giving a 86% response rate. DNV has checked all the questionnaires received. The survey shows that 100% of the investigated people are supportive to the project construction and no negative opinions received.</p>		OK
E.1.2 Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	Yes. The distribution of questionnaires to local stakeholders has been used to invite the comments from the local stakeholders.		OK
E.1.3 If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/ /54/ /55/	DR CC	Yes. The stakeholder consultation process is in accordance with the <i>Law of the People's Republic of China on Evaluation of Environmental Effects and Environmental Protection Law of the People's Republic of China.</i>		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
E.1.4	Is a summary of the stakeholder comments received provided?	/1/	DR	Yes. A summary of the stakeholder comments has been provided in section E.2 of PDD.		OK
E.1.5	Has due account been taken of any stakeholder comments received?	/1/	DR	The survey shows that 100% of the investigated people are supportive to the project construction and no negative comments are received.		OK

**Table 3 Resolution of corrective action requests and clarification requests**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
N/A	N/A	N/A	N/A

**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**

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### **INITIAL VALIDATION PROTOCOL**

**Table 1 Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities**

Requirement	Reference	Conclusion
<b>About Parties</b>		
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	<del>CAR-1</del> 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	<del>CAR-1</del> 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
<b>About additionality</b>		

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Requirement	Reference	Conclusion
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 that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK
<b>About forecast emission reductions and environmental impacts</b>		
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
<b>For large-scale projects only</b>		
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	N/A
<b>About stakeholder involvement</b>		
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
<b>Other</b>		
15. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
16. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
17. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK

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Requirement	Reference	Conclusion
18. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B, EB Decision	OK
19. 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*	COMMENTS	Draft Concl.	Final Concl.
<b>A General Description of Project Activity</b> <i>The project design is assessed.</i>					
<b>A.1. Project Boundaries</b> <i>Project Boundaries are the limits and borders defining the GHG emission reduction project.</i>					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/1/	DR	Yes. The project is located in Xiliuzhi Village, Xiliuzhi Countryside, Qi County, Jinzhong City, Shanxi Province, P.R. China. The geographical coordinates are north latitude 37°4'5" and east longitude 112°1'25".		OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1/	DR	Yes. The project system boundaries are clearly defined. The glass kilns where the switch occurred in fuel from coal to natural gas are defined as project system boundaries.		OK
<b>A.2. Participation Requirements</b> <i>Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.</i>					
A.2.1. Which Parties and project participants are participating in the project?	/1/	DR	<b>Involved Parties:</b> China as Host Country, and United Kingdom of Great Britain and Northern Ireland as Annex I Country.  <b>Project Participants:</b> Shanxi Hongyi Glassware Co., Ltd. as the project owner and Trading Emissions PLC as the CER buyer.	<del>CAR-1</del>	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/ /13/	DR	No. China issued the LoA on 30 April 2009. However, the LoA from United Kingdom of Great Britain and Northern Ireland has not been obtained.	<del>CAR-1</del>	OK
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/	DR	China ratified the Kyoto Protocol on 30 August 2002, and United Kingdom of Great Britain and Northern Ireland ratified the Kyoto Protocol on 31 May 2002.  <b>Voluntary Participation:</b> China issued the LoA on 30 April 2009 authorising Shanxi Hongyi Glassware Co., Ltd. as a project participant, while the LoA from United Kingdom of Great Britain and Northern Ireland is pending.  <b>Designated National Authority:</b> The host country DNA is the National Development and Reform Commission (NDRC) of China and the DNA of United Kingdom is Global Carbon Markets in Department of Energy and Climate Change (DECC).	<del>CAR-1</del>	OK
A.2.4. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/1/	DR	The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards China.		OK
<b>A.3. Technology to be employed</b> <i>Validation of project technology focuses on the project</i>					

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>engineering, choice of technology and competence/maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.</i>					
A.3.1. Does the project design engineering reflect current good practices?	/1/ /5/	DR	Yes. The project design engineering reflects good practices.		OK
A.3.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/1/	DR	Whether the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies need to be further clarified.	CL-1	OK
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1/ /10/	DR	Yes. A CDM group has been established to carry out the monitoring work. Its staff has been trained.		OK
<b>A.4. Contribution to Sustainable Development</b> <i>The project's contribution to sustainable development is assessed.</i>					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/8/	DR	The LoA from DNA of China stated that the project assists China in achieving sustainable development.		OK
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/1/ /5/	DR	Yes. The project creates employment opportunities for the residents, increases income of local governments and mitigates the atmospheric emissions of pollutants and improves the local air quality.		OK
<b>A.5. Small scale project activity</b> <i>It is assessed whether the project qualifies as small-scale</i>					

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>CDM project activity</i>					
A.5.1. 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/	DR	Yes. The project relates to the fuel switch from coal to natural gas which leads to the emission reduction of less than 60kt CO <sub>2</sub> annually. Hence the project fulfils the criteria for type III small scale projects.		OK
A.5.2. Is the small scale project activity not a debundled component of a larger project activity?	/1/ /5/	DR I	No. The proposed project is not a debundled component of a larger project as there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity with the same project participants, in the same project category and technology or measure.		OK
<b>B Project Baseline</b> <i>The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.</i>					
<b>B.1. Baseline Methodology</b> <i>It is assessed whether the project applies an appropriate baseline methodology.</i>					
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/ /2/	DR	Yes. The project applies AMS-III.B version 14 <i>Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories</i> , Type III – other project activities, categories III.B – Switching fossil fuels.		OK
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/ /2/	DR	Whether all the applicability criteria in the baseline methodology are fulfilled needs to be further identified. The paragraph 7-11 of	<del>CL-2</del>	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
	/3/		AMS.III.B version 14 need to be further specified.		
<b>B.2. Baseline Scenario Determination</b> <i>The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.</i>					
B.2.1. What is the baseline scenario?	/1/ /2/	DR I	The baseline scenario is the continuation of the present practice of coal consumption of as fuel for powering the glass kilns.		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/ /2/	DR I	No. There is no other alternative scenario according to AMS-III.B, version 14.		OK
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/ /2/	DR	Refer to B.2.2.		OK
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/ /2/	DR I	Refer to B.2.2.		OK
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/ /2/	DR I	Yes. National & sectoral policies have been considered in determining baseline scenario. Refer B.2.2.		OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/ /2/	DR I	Refer to B.2.2.		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.2.7. Have the major risks to the baseline been identified?	/1/ /2/	DR	There are no significant risks have been identified.		OK
<b>B.3. Additionality Determination</b> <i>The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.</i>					
B.3.1. Is the project additionality assessed according to the methodology?	/1/ /2/ /3/	DR I	The project additionality is demonstrated by applying simplified baseline methodology AMS-III.B “ <i>Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories,</i> ” version 14 and the Appendix B of the simplified modalities and procedures for small-scale CDM project activities		OK
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1/	DR	<p>The project additionality is justified by using the investment benchmark of 12% Internal Rate of Return (IRR) for the glass industry according to <i>Methods and Parameters for Economic Assessment of Construction Projects</i> version 3</p> <p>Enough evidences need to be provided to demonstrate the propriety in the selection of investment benchmark and NPV. Moreover, the resources of input data for NPV calculation also are requested to be specified in PDD:</p> <p>1)PP needs to state whether the 12% IRR from glass industry is reasonable , and</p>	CL-3	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>whether the government provided figure is still valid.</p> <p>2) The NPV calculation of Fuel Operating costs needs to be provided.</p> <p>3) Whether the NCVs of coal and natural gas and also the cost of coal and natural gas were valid at the time of decision making need to be clarified.</p> <p>4) The reasonableness of the investment cost needs to be clarified.</p> <p>It was stated in the PDD that the expected operational lifetime of the proposed project is 22 years. However, 25 years were selected in IRR calculation. The justification in searching 25 years in NPV calculation shall be provided.</p>	CAR 2	
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	Refer to Section B.3.2	CL 3	OK
B.3.4. If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/1/ /2/ /9/ /12/	DR	<p>It was stated in the PDD that the starting date of the proposed project is 10 February 2007, which is before the date of validation. How it has been identified shall be explained and further documentary evidences need to be provided.</p> <p>The Project owner contracted the CDM consultant on 23 June 2007 and Emission Reduction Purchase Agreement was signed in</p>	CL 4  CAR 3	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			October 2008. There's a time gap between above two dates in which no activities regarding CDM can be identified. Sufficient documentary evidences such as the evidence of the CDM revenues being decisive for the project, etc. need to be provided to demonstrate CDM was seriously considered.		
<b>B.4. Calculation of GHG Emission Reductions – Project emissions</b> <i>It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Yes. The proposed project applies AMS-III.B, version 14 to determine project emissions. All the calculations are documented in a complete and transparent manner.		OK
B.1.3. Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Yes. Conservative assumptions have been used in project emissions calculation.		OK
B.1.4. Are uncertainties in the project emission estimates properly addressed?	/1/	DR	There are no significant uncertainties in the project emission.		OK
<b>B.5. Calculation of GHG Emission Reductions – Baseline emissions</b> <i>It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values</i>					

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>– where applicable – is justified.</i>					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /2/	DR	Yes. The calculations are according to the approved methodology AMS-III.B, version 14.		OK
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/ /2/	DR	Yes. Conservative assumptions have been used in baseline emissions calculation.		OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/ /2/	DR	There are no significant uncertainties in the project emission.		OK
<b>B.6. Calculation of GHG Emission Reductions – Leakage</b> <i>It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /2/	DR	No leakage emission is required according to the approved methodology AMS-III.B, version 14.		OK
B.6.2. Have conservative assumptions been used when calculating the leakage emissions?	/1/ /2/	DR	Refer to B.6.1.		OK
B.6.3. Are uncertainties in the leakage emission estimates properly addressed?	/1/ /2/	DR	Refer to B.6.1.		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>B.7. Emission Reductions</b> <i>The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.</i>					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1/	DR	Yes. The emission reductions are real, measurable and give long-term benefits related to the mitigation of climate change.		OK
<b>B.8. Monitoring Methodology</b> <i>It is assessed whether the project applies an appropriate monitoring methodology.</i>					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	The monitoring plan is described in the PDD and is in accordance with the simplified approved methodology AMS-III.B, version 14.		OK
B.8.2. Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR	All data collected as part of the monitoring plan will be archived electronically and be kept at least two years after the end of the crediting period.		OK
<b>B.9. Monitoring of Project Emissions</b> <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>					
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/ /2/ /6/	DR	It has stated in the PDD that the following parameters will be monitored during the crediting period according to AMS-III.B version 14:		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>FC<sub>y</sub> – Volume of Natural gas consumed in the project boiled in year y; Q<sub>y</sub> – Mass of production of glassware in year y.</p> <p>The table B.7.1 of the PDD needs to be detailed in terms of the type of instrument being used, frequency of logging data, calibration and the accuracy of the measurement equipment, etc. This is essential as the project is operating. These information need to be described in the PDD. Moreover, the procedures in place on how to deal with erroneous measurements are needed also.</p>	CL-5	
<b>B.10. Monitoring of Baseline Emissions</b> <i>It is established whether the monitoring plan provides for reliable and complete baseline emission data over time.</i>					
B.10.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/ /2/	DR	<p>The project uses the ex-ante determination approach to calculate baseline emissions.</p> <p>The ex-ante fixed factor of tonne CO<sub>2</sub> emission /tonne product needs to be provided in the PDD. The CER excel worksheet and all the historic data need to be provided.</p>	CAR-4	OK
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/ /2/	DR	Yes. CO <sub>2</sub> is the only GHG indicator which needs to be considered in the proposed project.		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/ /2/	DR	N/A		OK
B.10.4. Is the measurement <i>equipment</i> described and deemed appropriate?	/1/ /2/	DR	The calibration of the natural gas meter and the precision of the meter need to be provided for validation.	<del>CL-6</del>	OK
B.10.5. Is the measurement <i>accuracy</i> addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/ /2/	DR	Refer to B.10.4	<del>CL-6</del>	OK
B.10.6. Is the measurement <i>interval</i> for baseline data identified and deemed appropriate?	/1/ /2/	DR	Refer to B.10.4	<del>CL-6</del>	OK
B.10.7. Is the registration, <i>monitoring</i> , <i>measurement</i> and <i>reporting</i> procedure defined?	/1/ /2/	DR	N/A		OK
B.10.8. Are procedures identified for <i>maintenance</i> of monitoring equipment and installations? Are the calibration intervals being observed?	/1/ /2/	DR	N/A		OK
B.10.9. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/ /2/	DR	N/A		OK
<b>B.11. Monitoring of Leakage</b> <i>It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.</i>					

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/ /2/	DR	N/A		OK
B.11.2. Are the choices of project leakage indicators reasonable and conservative?	/1/ /2/	DR	N/A		OK
B.11.3. Is the measurement method clearly stated for each leakage value to be monitored and deemed appropriate?	/1/ /2/	DR	N/A		OK
<b>B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts</b> <i>It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.</i>					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/ /2/ /6/	DR	The monitoring of sustainable development indicators is not required by Chinese DNA. The environmental impacts are identified in the EIA that was approved on 16 September 2006		OK
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/ /2/ /5/	DR	N/A		OK
B.12.3. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/ /2/ /5/	DR	N/A		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>B.13. Project Management Planning</b> <i>It is checked that project implementation is properly prepared for and that critical arrangements are addressed.</i>					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1/ /2/	DR I	Authority and responsibility of the project management is described in the PDD.  However, the Monitoring and Operation Manual is need to be provided.	<del>CL</del> 7	OK
B.13.2. Are procedures identified for training of monitoring personnel?	/1/ /2/	DR I	Refer to B.13.1.	<del>CL</del> 7	OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/ /2/	DR I	Refer to B.13.1.	<del>CL</del> 7	OK
B.13.4. Are procedures identified for review of reported results/data?	/1/ /2/	DR	Yes. The data collected is physically recorded and will be cross-checked with all the information of the natural gas supplier invoices every month.  Glassware production will be measured through output and data will be physically recorded on a daily basis by the area operator.		OK
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/ /2/	DR	Yes. The metering equipment will be properly configured and checked annually according to the requirement according to the relevant standards		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>C Duration of the Project/ Crediting Period</b> <i>It is assessed whether the temporary boundaries of the project are clearly defined.</i>					
C.1.1. Are the project's starting date and operational lifetime clearly defined and evidenced?	/1/	DR	Refer to B.3.4.	CL-4	OK
C.1.2. Is the start of the crediting period clearly defined and reasonable?	/1/ /3/	DR	The start of the crediting period is 01 January 2010 in the GSP PDD, it needs to be updated.	CL-8	OK
<b>D Environmental Impacts</b> <i>Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.</i>					
D.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity ?	/1/ /19/	DR	Yes. In line with Environmental Protection Law of the People's Republic of China, the Project Entity must analyze the environmental impacts of the Project Activity before receiving approval of project construction.		OK
D.1.2. Does the project comply with environmental legislation in the host country?	/1/ /6/	DR	Yes. The Environmental Impact Registration for the project had been approved by Qi County Environmental Protection Agency.		OK
D.1.3. Will the project create any adverse environmental effects?	/1/ /5/	DR	The adverse environmental effects created by the proposed project are not significant.		OK
D.1.4. Have environmental impacts been identified and addressed in the PDD?	/1/ /5/	DR	Yes. No negative environmental impacts will occur due to the proposed project activity.		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>E Stakeholder Comments</b> <i>The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.</i>					
E.1.1. Have relevant stakeholders been consulted?	/1/ /19/	DR	Yes. The stakeholder consultation process has been conducted in August 2006 according to Environmental Protection Law of the People's Republic of China/19/.		OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	The stakeholder consultation was organized in August 2006, when 45 questionnaires were distributed for obtains comments from stakeholders and all 45 copies had been collected. However, only 30 copies were completed. The reason why needs to be explained and all 45 questionnaire copies need to be provided. A summary of the stakeholder comments is needed to be included in the PDD also.	<del>CL-9</del>	OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR	Refer to E.1.1.		OK
E.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR	Refer to E.1.2.	<del>CL-9</del>	OK
E.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR	Yes.		OK

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

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl
<b>A.1. Letter of approval</b>					
A.1.1 Is the LoA received directly from the DNA or through the project participant.	/1/ /2/ /13/	DR	LoA from United Kingdom of Great Britain and Northern Ireland has not been obtained.  The LoA from China was received through the project participant.	<del>CAR-1</del>	OK
<b>A.2. Project design</b>					
A.2.1 Does the PDD describe the CDM project activity with all relevant elements in a transparent and accurate way?	/1/ /2/ /3/ /5/	DR	Yes, the project location, the technology of the project are clearly described in the PDD and in line with the approved FSR, system boundaries determination in line with the approved methodology AMS.III.B and the production capacity, the equipments and parameters are reflected in FSR and Equipments Purchase Contract. Additionality analysis is in line with the relevant EB “Appendix B of the simplified modalities and procedures for small-scale CDM project activities”		OK
A.2.2 Has the CDM project activity at the start of the validation been constructed or does the CDM project activity use existing facilities or equipment?	/1/ /5/	DR I	The commission of CDM project activity has started in January 2008 which was before the start date of the PDD publication on 5 September 2009.  In the Project Activity only the fuel combustion devices of the equipments are changed, the glass-making equipment remains the same.		OK

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A.2.3 Is the project a large scale project, a small scale project with average annual emission reductions above 15 000 tonnes or a bundled small scale project? Has on-site visit been carried out?	/1/ /2/ /5/	DR I	The project activity is a non-bundled small scale project with the emission reductions per year exceeding 15 000.  As the utilization of some existing facilities are involved in the project, the on-site visit has been carried out on 26 February 2010 by Lai Chee Keong, Huang Peng from DNV.		OK
A.2.4 Does the project activity involved alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/ /5/	DR I	Yes. In the Project Activity the fuel combustion devices of the equipments are changed, The differences between pre-project and post-project activity have been clearly described in the PDD.		OK
<b>A.3. Project emissions not addressed by the methodology</b>					
A.3.1 Does the methodology describe all project emission source for the project activity that contributes all 1% of the emission reductions? Sources that the methodology considers not to take into account are not relevant (e.g. cement and iron consumption for building hydropower plants).	/1/	DR	Yes. CO2 is the only GHG emission source for the project activity that contributes more than all 1% of the emission reductions which is described in methodology.		OK
<b>A.4. Documentation of baseline emissions</b>					
A.4.1 Documentation of the baseline determination:	/1/	DR	a. Yes, All data In the PDD used to determine the baseline emissions are from the EIA, FSR and other reference document.	CL-2	OK
a. 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.	/2/		b. Yes, according to the reference list, all documents of the baseline determination were correctly quoted and interpreted.		
b. All documentation is relevant as well as correctly quoted and interpreted.	/3/		c. The EIA registration form was ratified by the Qi County Environmental Protection Agency, dated 16 September 2006, and the FSR was approved by Shanxi Qi County Planning Commission, dated 16 August 2006,		
c. Assumptions and data can be deemed reasonable	/5/				
d. Relevant national and/or sectoral policies and circumstances are considered and listed in the	/6/				

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PDD. e. The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity			and all other document of the baseline determination can be verified, the data can be deemed reasonable.  d.National & sectoral policies have been considered and listed in the PDD.  e. Whether all the applicability criteria in the baseline methodology are fulfilled needs to be further identified. The paragraph 7-11 of AMS.III.B version 14 need to be further specified.		
<b>A.5. Documentation of the calculations</b>					
A.5.1 Algorithms and/or formulae used to determine emission reductions 1)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 2)All documentation is correctly quoted and interpreted. 3)All values used can be deemed reasonable in the context of the project activity 4)The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.	/1/ /4/ /5/	DR	Enough evidences need to be provided to demonstrate the propriety in the selection of investment benchmark and NPV. Moreover, the resources of input data for NPV calculation also are requested to be specified in PDD.	<del>CL</del> 4	OK
<b>A.6. Implementation of the monitoring plan</b>					
A.6.1 How were the plans for implementation of the monitoring plan, data management, QA/QC procedures assessed? To what extent can the emission reductions achieved by the project be monitored ex-post and verified later by a DOE?	/1/	DR	The monitoring plan, as described in the PDD, is in line with the methodology AMS-III.B version 14 and, if implemented correctly, will allow for reliable and complete	<del>CL</del> 7	OK

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			project emission data monitoring over time and the complete verification by a DOE. The monitoring and management manual should be provided for validation.		
<b>A.7. CDM consideration prior to starting date</b>					
A.7.1 The prior consideration of CDM for the project activity complies with EB41 annex 46	/1/ /5/	DR	The Project owner contracted the CDM consultant on 23 June 2007 and Emission Reduction Purchase Agreement was signed in October 2008. There's a time gap between above two dates in which no activities regarding CDM can be identified. Sufficient documentary evidences need to be provided to demonstrate CDM was seriously considered.	<del>CAR-3</del>	OK

**Table 3 Resolution of Corrective Action and Clarification Requests**

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p><b>CAR 1</b></p> <p>The LoA from United Kingdom of Great Britain and Northern Ireland has not been obtained.</p>	<p>A.2.2</p> <p>A.2.3</p>	<p>The LoA from United Kingdom of Great Britain and Northern Ireland has been provided to DNV.</p>	<p>OK.</p> <p>The LoA from the United Kingdom of Great Britain and Northern Ireland has been obtained and verified.</p> <p>CAR 1 is closed.</p>
<p><b>CAR 2</b></p> <p>It was stated in the PDD that the expected operational lifetime of the proposed project is 22 years.</p> <p>However, 25 years were selected in IRR calculation. The justification in searching 25 years in NPV calculation shall be provided.</p>	<p>B.3.2</p>	<p>22 years lifetime was a typing mistake, 25 years of the project operational lifetime is correct. The FSR (page 12) states that the lifetime for a furnace is 30 years. The proposed project only involves the switch fuel system, the project facility lifetime will not be changed.</p> <p>The actual furnace started operation in 2003, after fuel switch for the fuel system, the proposed project started operation in 2008. Therefore, we consider the proposed project lifetime to be 25 years. The PDD is revised accordingly. Moreover, the document of 'Furnace label' is provided to DNV.</p>	<p>OK.</p> <p>After checking the FSR and the document of 'Furnace label', DNV verified the lifetime of the project is 25 years.</p> <p>The revised PDD and financial analysis are verified to use the lifetime of 25 years.</p> <p>CAR 2 is closed.</p>
<p><b>CAR 3</b></p> <p>The Project owner contracted the CDM consultant on 23 June 2007 and Emission Reduction Purchase Agreement was signed in October 2008. There's a time gap between above two dates in which no activities regarding CDM can be identified. Sufficient documentary evidences such as the evidence of the CDM revenues being decisive for the project, etc. need to be provided to demonstrate CDM was seriously considered.</p>	<p>B.3.4.</p>	<p>The CDM consultant contacted with many CER buyers/developers, but no one contacted was familiar with PDD methodology of developing small fuel switch project as this project is the first one of its kind in China.</p> <p>Because this is a first of its kind project in-depth due-diligence work had been done by the CER Buyer before signature of the ERPA. The PDD consultant also arranged additional CDM and PDD methodology investigation to ensure this project is feasible for developing CDM.</p> <p>Please see the updated timeline in the PDD section B.5.</p>	<p>OK.</p> <p>DNV has checked the facts provided by the PP in PDD section B.5 and verified that the CDM benefits were considered in the shareholders meeting on 10 October 2006. The CDM consulting contract between the project owner and Shanxi Huaaoda Green Industry Development Ltd. was signed on</p>

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Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
			14 April 2006. It is DNV's opinion that these events demonstrate that the project developer was aware of CDM prior to project's start date and CDM benefits were a decisive factor in the decision to proceed with the investment. CAR 3 is closed.
<p>CAR 4</p> <p>The ex-ante fixed factor of tonne CO<sub>2</sub> emission /tonne product needs to be provided in the PDD. The CER excel worksheet and all the historic data need to be provided.</p>	B.10.1.	<p>The PDD is updated accordingly also shown as below:</p> <p><b>Project emissions:</b></p> $PE_y = FC_y \times NCV_{NG} \times EF_{NG}$ $= 14,000,000 \text{ Nm}^3 \times 36.12 \text{ MJ/Nm}^3 \times 58.3 \text{ tCO}_2/\text{TJ} / 1,000,000$ $= 29,481.1 \text{ tCO}_2$ <p><b>Baseline emissions:</b></p> $BE_y = EF_{BSL} \times Q_{PJ,y}$ $= (FC_{BSL} * EF_{CO2,j} * NCV_j) / Q_{BSL,j} \times Q_{PJ,y}$ $= (87887.23 \text{ t} * 87.3 \text{ tCO}_2/\text{TJ} * 0.025 \text{ TJ/t}) / (6.16 \times 10^4 \text{ t}) * 24,000 \text{ t} = 74,732.68 \text{ tCO}_2$ <p>The CER excel worksheet and all the historic data has been provided to DNV.</p>	<p>OK.</p> <p>The calculation of ex-ante emission factor of tonne CO<sub>2</sub> emission / tonne of production, i.e. <math>EF_{BEL}</math>, was documented in the section B.6 of PDD, which has been reviewed and accepted by DNV.</p> <p>The spreadsheet for the calculation of CER and the historic data has been obtained and verified by DNV.</p> <p>CAR 4 is closed.</p>
<p>CL 1</p> <p>Whether the project use state of the art</p>	A.3.2	The Project Activity adopts the advanced domestic technology of natural gas combustion and automatic	<p>OK.</p> <p>DNV obtained and checked the</p>

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Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
technology or would the technology result in a significantly better performance than any commonly used technologies need to be further clarified.		control system. Additional parameters were listed in PDD section A.4.2. The new technique adopted in this project is advanced in China and not commonly adopted because the cost of natural gas is far higher than coal.  The commonly adopted alternative to the project would be coal-fired technology. Outside potential CDM revenue there is no inherent performance related benefit from adopting this new natural gas technology at extra cost compared to coal technology apart from providing better working conditions for workers as well as an improved local environment.  The equipment purchase agreement and the equipment technical agreement have provided to DNV.	equipment purchase agreement and the equipment technical agreement and can verified that the Project Activity adopts the advanced domestic technology and reflected the good practice. CL 1 is closed.
CL 2 Whether all the applicability criteria in the baseline methodology are fulfilled needs to be further identified. The paragraph 7-11 of AMS.III.B version 14 need to be further specified.	B.1.2	The baseline methodology used in the previous PDD was AMS-III.B. (Version 14), It has been updated to version 14. The justification of applicability criteria is also updated in the revised version of PDD section B.2.	OK. DNV checked the revised PDD and confirmed that all the applicability criteria in the baseline methodology are fulfilled. CL 2 is closed.
CL 3 Enough evidences need to be provided to demonstrate the propriety in the selection of investment benchmark and NPV. Moreover, the resources of input data for NPV calculation also are requested to be specified in PDD: 1) The PP needs to state whether the 12% IRR from glass industry is reasonable, and whether the government provided figure is still valid. 2) The NPV calculation of Fuel Operating costs	B.3.2 B.3.3	PDD is updated, and the relevant evidences such as the benchmark source and NPV selection source are provided:  1) 12% benchmark was adopted from the <i>Methods and Parameters for Economic Assessment of Construction Projects (version 3)</i> , which is a reasonable and still valid source published by Chinese National Development and Reform Commission and Construction Ministry in Dec 2006.	OK. The relevant evidences provided by project owner and contents revised in NPV and PDD have been verified.  CL 3 is closed.

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Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion						
needs to be provided. 3) Whether the NCVs of coal and NG and also the cost of coal and NG were valid at the time of decision making need to be clarified. 4) The reasonableness of the investment cost needs to be justified with the actual cost incurred in the implementation of the project.		<p>2) The updated NPV calculation spreadsheet is provided with Fuel operation costs analysis.</p> <p>3) The NCVs/cost of coal and NG are valid at the time of investment decision making.</p> <p>NCV of Coal and NG which applied in the PDD is adopted from FSR, also those NCV values has been confirmed by the Local Authority of ‘Shanxi Coal Quality Measuring Centre’ and ‘Qixian Jieyuan Gas Co., Ltd’.</p> <ul style="list-style-type: none"><li>The cost of coal and NG in the PDD was adopted from FSR, which is before the investment decision making. The cost of NG was also being confirmed in the NG Supply Agreement. The cost of coal can be cross-checked by the coal receipt.</li></ul> <p>4) For Investment cost, the following evidences are provided: ‘Total investment -breakdown table.xlsx’ ‘CL3-Pipeline Construction &amp; Installation Agreement.JPG’</p> <p>The total investment cost can be cross-checked by a few main contracts, which has been summarized as follow:</p> <table><tr><td>Contract</td><td>Cost (RMB)</td></tr><tr><td>Engineering Procurement &amp; Construction Contract</td><td>782,582</td></tr><tr><td>Technical agreement &amp;</td><td>11,000</td></tr></table>	Contract	Cost (RMB)	Engineering Procurement & Construction Contract	782,582	Technical agreement &	11,000	
Contract	Cost (RMB)								
Engineering Procurement & Construction Contract	782,582								
Technical agreement &	11,000								

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Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response				Validation team conclusion
			Equipment Purchase Contract			
			Product Order Contract	2,449,710		
			NG supplement agreement	143,296		
			Pipeline Construction Installation Agreement	1,300,000		
			Total cost	4,686,592		
CL 4  It was stated in the PDD that the starting date of the proposed project is 01 February 2007, which is before the date of validation. How it has been identified shall be explained and further documentary evidences need to be provided.	B.3.4. C.1.1.	The explanation of the project starting date is updated in the PDD accordingly:  The Project Construction Contract date was taken as the project start date, which is 10 February 2007. This is in line with the CDM Glossary. As per the CDM Glossary of Term ver.4 ('the Glossary'), the starting date of a CDM Project Activity is the earliest date at which either the implementation or construction or a real action of a Project Activity begins.  In light of the above definition, the starting date of a CDM Project Activity is further clarified in the Glossary as the date on which the Project Activity participant has committed to the expenditures related to the implementation or related to the construction of a Project Activity. The Project Construction Contract was signed on 10 February 2007, and the Construction date was on 12 February 2007 (as stated in the Construction Contract), the Equipment Purchase Contract was signed in April 2007. Therefore, the signing date (10 February 2007) of the Project Construction Contract shall be regarded as the start				OK.  The project owner signed the construction contract on 10 February 2007 /9/.  The construction contract commencement of the project is 12 February 2007 /22/.  The project owner signed the equipment purchase agreement in April 2007 /7/. The date 10 February 2007 for signing construction contract is thus considered as the starting date of the project, which is prior to the date of PDD publication, 5 September 2009.  On the basis of the EB41 Para 67, it is DNV's opinion that this date correctly represents the earliest date of the implementation, construction or

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Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion								
		date of the Project Activity, as it was the first date for the Project Activity to commit to the expenditures related to the implementation of the Project Activity. The relevant evidences have been provided to DNV.	real action dates. CL 4 is closed.								
CL 5  The table B.7.1of the PDD needs to be detailed in terms of the type of instrument being used, frequency of logging data, calibration and the accuracy of the measurement equipment, etc, considering that the project is implemented. This is essential as the project is operating.These information need to be described in the PDD. Moreover, the procedures in place on how to deal with erroneous measurements are needed also.	B.9.1.	<div>Parameter of NG metering equipment and backup meter<table><tr><td>Type</td><td>CQ-100L-1.5-1.6/0.2-IC</td></tr><tr><td>Calibration range</td><td>32-650 m³/h</td></tr><tr><td>Accuracy</td><td>1.5</td></tr><tr><td>Error</td><td>±0.30%</td></tr></table></div> <div>Parameters of monitoring equipments, the error handling method and more comprehensive procedures are updated in the PDD accordingly. Document list-No.35 is provided for evidence for each of equipments.</div> <div>In the event that a meter has lost calibration over the allowable error limit then this shall be corrected at the earliest opportunity and re-calibrated and the data recorded from this meter since the last successful calibration shall be ignored.</div> <div>In the event that there is uncertainty over the accuracy of the data set for natural gas amount from the main meter (e.g. the meter has lost calibration over the acceptable error limit) then the data from the back-up meter shall be used.</div>	Type	CQ-100L-1.5-1.6/0.2-IC	Calibration range	32-650 m³/h	Accuracy	1.5	Error	±0.30%	OK. The relevant contents updated in PDD have been verified. The evidence provided by PP has been verified. CL 5 is closed.
Type	CQ-100L-1.5-1.6/0.2-IC										
Calibration range	32-650 m³/h										
Accuracy	1.5										
Error	±0.30%										
CL 6  The calibration of the natural gas meter and the precision of the meter need to be provided for validation.	B.10.4  B.10.5  B.10.6	<div>Parameter of NG metering equipment and backup meter<table><tr><td>Type</td><td>CQ-100L-1.5-1.6/0.2-IC</td></tr><tr><td>Calibration range</td><td>32-650 m³/h</td></tr><tr><td>Accuracy</td><td>1.5</td></tr><tr><td>Error</td><td>±0.30%</td></tr></table></div> <div>The calibration of the NG meter is 32-650m³/h, and</div>	Type	CQ-100L-1.5-1.6/0.2-IC	Calibration range	32-650 m³/h	Accuracy	1.5	Error	±0.30%	OK. The relevant contents updated in PDD have been verified. The calibration of the NG meter has been obtained and verified by DNV.
Type	CQ-100L-1.5-1.6/0.2-IC										
Calibration range	32-650 m³/h										
Accuracy	1.5										
Error	±0.30%										

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Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		the precision of the meter is 1.5. The calibration report of the NG meter has been provided to DNV.	CL 6 is closed.
CL 7 The Monitoring and Operation Manual needs to be provided.	B.13.1. B.13.2. B.13.3.	The Monitoring and Operation Manual has been provided to DNV.	OK. The Monitoring and Operation Manual has been obtained and verified by DNV. CL 7 is closed.
CL 8 The start of the crediting period is 01 January 2010 in the GSP PDD, it is not reasonable and needs to be updated.	C.1.2	The start of the crediting period is updated to 01 July 2011 or the actual date of CDM registration.	OK. The revised the PDD has been verified, CL 8 is closed.
CL 9 45 questionnaires were distributed for obtains comments from stakeholders and all 45 copies had been collected. However, The reason why only 30 copies were completed needs to be explained and all questionnaire copies need to be provided. A summary of the stakeholder comments is needed to be included in the PDD also.	E.1.2. E.1.4.	The project site is located in an industrial area with few stakeholders in the direct vicinity of the project. The Project Entity therefore took a large catchment area for the identification of stakeholders. 45 households were initially identified by the Project Entity initially and the same copies of stakeholder questionnaires were requested in the application form from the Project Entity to the government. As a number of these identified stakeholders lived so far away from the project site (i.e. in another jurisdiction) the environmental bureau only advised the issuance of 35 copies of the questionnaire for the stakeholders that could reasonably be affected by the Project Activity. During environmental impact assessment three local villages and two government departments were involved and each was distributed 7 copies. In total 30 copies of questionnaires were completed.	OK. The evidence provided by PP has been verified. CL 9 is closed.

## **APPENDIX C**

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### **CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS**

**Kakaraparthi Venkata Raman** holds a bachelor degree (B.Tech) in Chemical Engineering and a Diploma in Management. He has an overall experience of 18 years in the Chemical Process Industry - Fertilisers and Chemicals industry (FACT). His main areas of work include a) Technical Services (for Ammonia, Urea, Co-generation thermal power plants (captive), and complex fertilizers plants) - 10 years b) Erection, commissioning and hands-on operation of state of art HTAS Ammonia plant - 4 years c) Management and operation of Sulphuric acid plant as Plant Manager - 2 years and d) two years in management Information System operation and assisting of top management in planning of operations.

While in FACT he has completed the ISO14001 EMS LA course and also involved in implementation of Environmental Management Systems and in conducting internal audits.

Experience prior to joining Fertiliser industry including six months experimental work on charcoal manufacture in Karnataka Regional Engineering college.

He has experience of around 5 years in validation and verification of numerous CDM projects. His qualification, industrial experience and experience in CDM demonstrate him sufficient sectoral competence in areas of (a) 1.1 Thermal energy generation from fossil fuels and Biomass as well as thermal electricity from solar (b) 1.2 Energy Generation from renewable energy sources (c) 5.1/4.13/11.1/12.1 Chemical Processes Industries and (d) 13.1 Waste handling and disposal.

**Xue Yanju, Andi** holds a Master Degree in Applied Chemistry. Having an overall experience of around four years. Prior to joining DNV having two years auditing experience in the implementation of quality management system such as ISO9001 standard for two years.

She has experience of around two years in validation and verification of numerous CDM projects in DNV, majoring in China. Her qualification, industrial experience and experience in CDM demonstrate her sufficient sectoral competence in "Energy Generation from Renewable Energy Sources".

**Lai Chee Keong** holds a Bachelor Degree in Applied Science majoring in Environmental Biology, a Master Degree in Environmental Engineering and a Post Graduate Diploma in Accounting and Finance. He possesses a combined Asian & International experience of more than 16 years in the field of environmental consulting and environmental auditing. His experience also covers the fields of environmental management and environmental impact assessment for various on-shore industries such as petro-chemical plants, general chemical plants, residential developments and industrial park developments.

He has also been actively involved in Management System audits such as ISO 9001, ISO 14001 and OHSAS 18001 standards in various industrial sectors for more than 7 years in DNV.

He has experience of more than 5 years in validation and verification of numerous CDM projects in DNV in Asia including those in South East Asia and China.

His qualification, industrial and investment experience and experience in CDM demonstrate him sufficient sectoral competence in “Energy Generation from Renewable Energy Sources”, “Waste Handling and Disposal” and “Animal Waste Management”.

**Huang Peng** holds a Bachelor Degree in Thermal Dynamic Engineering and a bachelor Degree in Mass Communication. He possesses experience of more than 8 years in the field of consulting and management of energy efficiency as part of his work in a thermal power plant and Iron & Steel plant. His experience also covers the fields of energy efficiency, resource conservation and cleaner production in various power plants and manufacture industries.

He has experience of more than 3 years in validation and verification of numerous renewable and energy efficiency CDM projects in DNV. He has also been actively involved in energy efficiency service projects in various industrial sectors for more than 2 years in DNV. Since 2007, he has worked in the fields of Climate Change Service including CDM, VCS, GS and WCD project and energy efficiency service.

Before joining DNV, Peng Huang has worked in Tsinghua Tonnegfang Co., Ltd, Sustainable Developing Center of NDRC and Energy Efficiency Department of NDRC. He has rich project development experiences in renewable energy and many other industry sectors. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in “Energy Generation from Renewable Energy Sources”.

**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.

**Hou Bao Jun** holds a Master Degree in Applied Chemistry. Having an overall experience of around 5 years. Prior to joining DNV, having around 4 years experience in thermal power plant and about 10 months experience in chemical cleaning field. He was responsible for the normal operation of water treatment equipment and was tasked to redesign the production process to raise its efficiency. He participated in the device process design and construction. He has accumulated rich experience in the construction of the power equipment. He is also

familiar with other areas of a power plant, namely the boiler system, the turbine system and the electricity system. His experience covers the fields of chemistry and energy.

His qualification, industrial experience demonstrate his sufficient sectoral competence in “Thermal Energy Generation from Fossil Fuels and Biomass including Thermal Electricity from Solar” and “Waste Handling and Disposal”.

**Alexander Osadchiev** holds a PhD’s Degree in Power Engineering. He has an overall experience of around thirty years. Prior to joining DNV he had around fifteen years experience in Power Engineering industry covering energy efficiency improvement, energy distribution and demand. His experience also covers the fields of quality, environmental and OHSAS management. He has also been actively involved in implementation and auditing of Management Systems such as ISO 9001, ISO 140001 and OHSAS 18001 standards in Power Engineering industry for more than three years.

He has experience of around 2 years in validation and verification of several CDM/JI projects in DNV, both in Russia & abroad.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar, Electricity distribution, Heat distribution, Energy demand.