VERIFICATION / CERTIFICATION REPORT

Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project in China

UNFCCC Registration Ref. No.: 1609

Monitoring Period: 1 March 2010 to 30 September 2010

REPORT NO. 2010-1833

REVISION NO. 02

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VERIFICATION/CERTIFICATION REPORT

Date of first issue: 27 April 2011	Project No.: PRJC-268716-2010-CCS-BEL	
Recommended for approval Ole A. Flagstad	Approved by	Organisational unit: DNV Climate Change and Environmental Services
Client: CAMCO International Limited		Client ref.: Mr. Zhang Yuzhong

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Summary:

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions reported for the "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" in China (UNFCCC Registration Ref. No. 1609) for the period of 1 March 2010 to 30 September 2010.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (version 2) of 21 July 2011, are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology (ACM0004, version 2) and the monitoring plan contained in the Project Design Document of 27 November 2008.

DNV Climate Change Services AS is able to certify that the emission reductions from the "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" during the period of 1 March 2010 to 30 September 2010 amount to 1 136 946 tonnes of CO_2 equivalent.

Report No.: 2010-1833	Subject Group: Environment	
Report title: "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" in China		
Work carried out by: Tang Zhiang, Zhang Xiaojun, Hou Baojun		
Work verified by: Ole Andreas Flagstad, Luis Filipe Tavares, Alexander Osadchiev		
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Abbreviations

BM	Build margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CO_2	Carbon dioxide
CM	Combined margin
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
FAR	Forward Action Request
GHG	Greenhouse gas(es)
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
NEPG	Northeast China power grid
OM	Operation Margin
PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change

1 INTRODUCTION

1.1 Objective

CAMCO International Limited has commissioned DNV Climate Change Services AS (DNV) to carry out the verification and certification of emission reductions reported for the "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" for the period of 1 March 2010 to 30 September 2010. This report contains the findings from the verification and a certification statement for the certified emission reductions.

Verification is the independent review and ex-post determination by the Designated Operation Entity (DOE) of the monitored reductions in the GHG emissions that have occurred as a result of the registered CDM project activity during a defined verification period.
Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

1.2 Scope

The scope of the verification is:

- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that the reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

The verification team has performed the site visit and verification activities based on the recommendations in the Validation and Verification Manual /11/.

1.3 Description of the Project Activity

Project Parties:	*China, United Kingdom of Great Britain and Northern Ireland, Switzerland*
Title of project activity:	*Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project*
Project participants:	*Anshan Iron and Steel Group Corporation, NATIXIS Environnement & Infrastructures, Camco International Limited, European Carbon Fund*
Location of the project activity:	*Tiexi District, Anshan City, Liaoning Province, China*

UNFCCC registration No: *1609*

Project's crediting period: *3 December 2008 – 2 December 2018 (Fixed)*

Verification period: *1 March 2010 to 30 September 2010*

According to PDD and as verified during site visit, the project activity involved design, construction and operation of a 300 MW combined cycle power plant, fuelled by surplus blast furnace gas and coke oven gas produced by Anshan Iron and Steel Group Corporation. The 300 MW generator adopted by the proposed project is manufactured by Mitsubishi Heavy Industry Corporation. The following equipments have been verified during the on site visit and confirmed to be in line with the PDD.

Equipment	Type and key parameters	Manufacturer
Gas turbine	M701S (F)	Mitsubishi Heavy Industry Corporation
Steam turbine	SRT-40.5ISB M701S (F) Pressure:10.3/2.94/0.49Mpa; Temperature :535˚C /535˚C /250 ˚C	Mitsubishi Heavy Industry Corporation
Generator	Synchronous Generator for MB-H M701S (F), 300MW, 16.5kv	Mitsubishi Heavy Industry Corporation
Heat Recovery Boiler	NG-701S(F)-R	Hanzhou Boiler Group Corporation

The output voltage of generator is 16.5 kV, which will be transformed to 220 kV, thereafter, delivered to connection lines of the Northeast China power grid (NEPG). DNV was able to confirm from the commissioning report issued by North-East Electric Power Science Institute dated 20 October 2007 /9/ that the project has been commissioned from October 2007. The claimed and certified emission reductions for the period 1 March 2010 to 30 September 2010 are 1 136 946 tCO_2 equivalent and net electricity generated is 1 136 319.48 MWh.

1.4 Description of the Project Activity

The "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" has been constructed and started operation of a 300 MW combined cycle power plant, fuelled by surplus blast furnace gas and coke oven gas produced in the process of Anshan Iron and Steel Group Corporation (Anshan). The project displaces electricity which otherwise was imported from the Northeast Power Grid, a coal fired power dominated power grid, and thus reduces GHG emissions.

The emission reduction calculations have been done as per the formulae provided in the registered PDD, which are in line with the formulae/methodology provided in the approved methodology.

The emission reductions ER_y by the project activity during the crediting period is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (LE_y), as follows:

Emission reductions (ER_y) = $BE_y - PE_y - L_y$

1) Baseline emissions: Baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity (EG_y in MWh).
2) Project emissions: the project emissions result from the fossil fuels which are used to generate the start-up steam. Detailed information please refer to the section 3.6.
3) Leakage: No leakage has to be considered for the proposed project activity.

The project has been registered as a CDM project on 3 December 2008. The emission reductions estimated in the registered PDD are 1 739 716 tonnes CO_2e per year.

2 METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. These include:

i. Review of project documentation.

ii. The ex-post determined grid baseline combined emission factor of 1.0027 tCO_2e/MWh for China Northeast Power Grid, and

iii. The actual installed capacity of the power plant to ensure the conformance with the descriptions in registered PDD.

DNV has during its preparations identified the key reporting risks and used the assessment to determine to which extent the project operator's control systems were adequate for mitigation of these key reporting risks. In addition, other areas that can have an impact on reported emission reductions have also undergone detailed audit testing.

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project.

Verification team

				Type of involvement						
Role/Qualification	***Last Name***	***First Name***	***Country***	Administrative	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	Sectoral competence
Project manager	Tang	Zhiang	China	√						
Technical team leader (CDM verifier)	Tang	Zhiang	China		√	√	√	√		
CDM verifier	Zhang	Xiaojun	China		√	√	√			√
Assessor under training with TA1.1 competence	Hou	Baojun	China		√					√
Technical Reviewer	Flagstad	Ole A.	Norway						√	
Tech area input to TR (TA4.3)	Tavares	Luis Felipe	Brazil						√	√
Tech area input to TR (TA1.1)	Osadchiev	Alexander	Russia						√	√

Duration of verification

Date of publication of Monitoring report: 26 October 2010

Preparations: From 8-12 November 2010

On-site verification: 15 November 2010

Reporting*:* From 16 November 2010 – 5 August 2011

2.1 Review of Documentation

According to Validation and Verification Manual /11/, desk review of the project documentation was conducted which involved:

(i) Review of the data and information presented to verify their completeness;

(ii) Review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures;

(iii) Evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions;

The following documents were reviewed during the desk review and formed the basis of the verification:

- the monitoring report /1/ (version 1 dated 18 October 2010 and version 2 dated 21 July 2011 for the period from 1 March 2010 to 30 September 2010);
- the registered PDD /13/;
- validation report issued by TUV-SUD /14/;
- verification reports for 1st 2nd and 3rd monitoring period issued by DNV /10/
- the approved baseline and monitoring methodology, ACM0004, version 2 /12/;
- daily and monthly electricity generation monitoring records /7/;
- calibration records for the monitoring equipments /5/;
- The project owner has in addition supplied the verification team with the operation manual from its management system /2/ as well as the data calculations necessary for verification of the required emission reductions /3/.

2.2 Site Visits

The site visit was carried out by DNV's verifier Tang Zhiang and Zhang Xiaojun on 15 November 2010, during which documentation was reviewed and key personnel was interviewed at the project site.

Name	Department/Company	Position
Mr. Gao Xingsheng	*Anshan Iron and Steel Group Corporation* Power plant	Operation leader
Mr. Liu Ming	*Anshan Iron and Steel Group Corporation*	Project engineer
Ms. Chang Ying	*Anshan Iron and Steel Group Corporation*	Section chief in Safety and Environment Department
Mr. Zhang Yuzhong	CAMCO International Limited	Operation Director
Mr. Fang Liqiang	CAMCO International Limited	Project manager

During the site visit, DNV reviewed and inspected procedures, equipment, meters and performed interviews with key personnel on the plant. The following topics were discussed:

(i) Assessment of the implementation and operation of the proposed CDM project activity as per the registered PDD;

(ii) Review of information flows for generating, aggregating and reporting the monitoring parameters;
(iii) Interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the monitoring plan in the PDD;
(iv) A cross-check between information provided in the monitoring report and data from other sources such as plant log books, inventories, purchase records or similar data sources;
(v) A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD and the selected methodology;
(vi) Review of calculations and assumptions made in determining the GHG data and emission reductions;
(vii) Identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

2.3 Reporting of Findings

A corrective action request (CAR) is issued, where:

i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
ii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
iii. Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A clarification request (CL) shall be 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 issued for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

The verification of the project resulted in one CAR and one CL which have been subsequently closed due to adequate response provided by the project proponent.

3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" for the period 1 March 2010 to 30 September 2010.

The period of project data achievement for both electronic and paper records is corrected in the latest monitoring report version 2, dated 21 July 2011 (please refer to CAR 1 in Appendix A).

The reasons on the significant increase for the emission reductions during the current monitoring period are clarified in the latest monitoring report version 2, dated 21 July 2011 (please refer to CL 1 in Appendix A).

3.1 Remaining Issues, CARs, FARs from Previous Validation

There are no remaining issues including CARs and FARs left unclosed from the previous verification /10/.

3.2 Project Implementation

The "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" has been constructed and started operation of a 300 MW combined cycle power plant, fuelled by surplus blast furnace gas and coke oven gas produced in the process of Anshan Iron and Steel Group Corporation (Anshan). During the site visit, DNV was able to verify that the power generation activity involves three sub-systems comprising of gas supply system, gas turbine generation system and steam turbine generation system. The main equipments of 300 MW combined cycle power plant were manufactured by Mitsubishi Heavy Industry Corporation. The waste heat recovery boiler is manufactured by Hangzhou Boiler Group Company Ltd. and all equipment conforms to the configuration described in the registered PDD /13/.

The net generated electricity has been considered for the emission reduction calculations. The gross electricity generation by the project activity is being monitored through electricity meter M10 (gross generation), auxiliary consumption by the meters M13-1 and M13-2, all located in the power station. The internal electricity consumption sourced from the back-up line from the Anshan Iron and Steel Group Corporation is being monitored through the meter M14 and is also used in calculating the net electricity supplied. The net electricity supplied to the Anshan Iron and Steel Group Corporation is calculated by the formulae (M10-M13 (I&II)-M14). Both electricity generation and internal electricity consumption has been verified through daily operation log and monthly meter records. Monthly meter records have been correctly transferred to a spreadsheet /3/. The net generated electricity of 1 136 319.48 MWh as stated in the monitoring report dated 21 July 2011 was supplied to the Anshan Iron and Steel Group Corporation (Anshan) during the monitored period 1 March 2010 to 30 September 2010.

The operation and maintenance training was provided by the equipment supplier /8/. The CDM related procedures, which includes monitoring, recording and reporting, were introduced by CAMCO International Limited /8/. Moreover, internal training records were verified by DNV.

3.3 Information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD

The actual net quantity of electricity supplied in the monitoring period is 11.47% higher than that projected in the PDD for 214 days (1 March 2010 to 30 September 2010). For more detailed information please refer to the section 3.6.

DNV confirm no other information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD except for stated above.

3.4 Compliance of monitoring plan with monitoring methodology

The monitoring plan follows the monitoring methodology on all elements with the exception of the determination of the auxiliary fuels used for the steam requirements during start up. As per the approved monitoring methodology (ACM0004, version 2), the mass or volume of the auxiliary fuel used by project activity (Q_{Coal}) should be measured in order to use and estimate the project emissions. As stated in the registered PDD the steam used for start-up is supplied by the existing external power plant of Anshan Iron and Steel Group Corporation, which uses a mixture of coal and BFG in order to generate its steam /13/. The PP therefore, and for conservative purposes outlined in the registered PDD, assumes that auxiliary fuel used to generated the required steam during start-up will be coal generated from a boiler with a 50% efficiency rate. Consequently the project emissions are calculated using not the formula from the Methodology

$$PE_y = \sum Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i$$

where:

PE_y	Project emissions in year y (tCO2)
Q_i	Mass or volume unit of fuel i consumed (t or m^3)
NCV_i	Net calorific value per mass or volume unit of fuel i (TJ/t or m^3)
EF_i	Carbon emissions factor per unit of energy of the fuel i (tC/TJ)
$OXID_i$	Oxidation factor of the fuel i (%)

But instead uses:

$$PE_y = \sum \frac{Q_{steam} \times H_{steam}}{\eta_{boiler}} \times EF_{CO2,Coal} \times OXID_{Coal}$$

where:

PE_y	Project emissions in year y (tCO2)
Q_{Steam}	Mass unit of steam consumed for start-up (tonnes);
H_{Steam}	Enthalpy of start-up steam, conservative figure at designed condition in the registered PDD is 3.1386 GJ/tonnes;
η boiler	Conservative boiler efficiency, = 50% (in registered PDD);
$EF_{CO2, Coal}$	CO_2 emissions factor per unit of energy of the coal, 0.0946 (tCO_2/GJ) from IPCC. Selection of the IPCC default value is justified since local values are not

available and there is no country-specific National data available in China.

$OXID_{Coal}$ Oxidation factor of the fuel coal (%), = 100%;

which equals to

$$PE_y = Q_{Coal} \times NCV_{Coal} \times EF_{CO2,Coal} \times OXID_{Coal} = \frac{Q_{steam} \times H_{steam}}{\eta_{boiler}} \times EF_{CO2,Coal} \times OXID_{Coal}$$

DNV is able to confirm that approach outlined in the PDD, Monitoring Plan and Monitoring Report is conservative and result in a higher number of project emissions for the project and consequently a lower amount of emission reductions.

DNV is able to confirm that, except for the parameter discussed above, elements the monitoring plan contained in the registered PDD of 27 November 2008 is in accordance with the approved methodology applied by the project activity, i.e. ACM0004 (version 2).

Detailed information please refer to the section 3.5.

3.5 Compliance of monitoring with the monitoring plan

The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD of 27 November 2008.

The reporting procedures accurately reflect the content of the monitoring plan. The monitoring mechanism is effective and reliable.

Electricity generated from the power plant was supplied to the Anshan Iron and Steel Group Corporation (Anshan) according to power purchase agreement between power plant and Anshan Iron and Steel Group Corporation (Anshan) dated 1 March 2009 /4/. As established during the validation, the power supplied to the Anshan Iron and Steel Group Corporation (Anshan) would otherwise have been imported from NEPG. Thus, DNV was able to verify that the generated electricity has replaced electricity that would have been sourced from the NEPG in the absence of the project

All the electricity meters, including main meters (M10, M13 (I & II), M14) and back-up meters (M11 and M12) which are measuring the net quantity of electricity supplied to the manufacturing facility are of 0.5S accuracy (0.5%) and were installed at the control room of the power station. The auxiliary steam used in start up is also monitored by flow, temperature and pressure. The annual calibrations of the meters have been executed by the Anshan Institute of Measurement and it was done on 27 October 2009. The related certificates /5/ has been reviewed during the site visit. Furthermore, by using the computer-monitoring system, the daily power generation is read and recorded every four hours by the staff on duty and kept in both paper and electronic form. The data has been combined into a monthly report and submitted to the CDM responsible person for review.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of PDD):	EG_{GEN} (M10)
Measuring frequency:	Continuously
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Energy meter
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy of the monitoring equipment stated in PDD is 0.5%.
Calibration frequency /interval:	Once per year
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Yes
Company performing the calibration:	Anshan Institute of Measurement
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is (are) calibration(s) valid for the whole reporting period?	Yes. Calibrated by Anshan Institute of Measurement dated 27 October 2009 valid for one year.
If applicable, has the reported data been cross-checked with other available data?	The reported data has been cross-checked with data from operation records/7/
How were the values in the monitoring report verified?	Thee daily records were reviewed, and EG_{GEN} was verified by calculating the difference between meter readings at the start and end of each month.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The data management system has been set up in accordance with monitoring plan of PDD. The correct transfer of data is checked by internal control process. The emission reductions are calculated using Excel worksheet, and the embedded formulas are transparent and have tested using the data in PDD. The QA/QC processes have been followed.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption	Not applicable

theoretically possible been applied or has a request for deviation been approved?	

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of PDD):	Qi
Measuring frequency:	Continuously
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Pressure meter, temperature meter, orifice plate and flow meter
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	No accuracy requirements of monitoring devices are stated in PDD. The PP has followed the good monitoring practise, and the accuracy of the monitoring equipment is 1%.
Calibration frequency /interval:	Once per year
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Yes
Company performing the calibration:	Anshan Institute of Measurement
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is (are) calibration(s) valid for the whole reporting period?	Calibrated by Anshan Institute of Measurement dated 27 October 2009 and valid for one year.
If applicable, has the reported data been cross-checked with other available data?	Not applicable
How were the values in the monitoring report verified?	The flow meter totalizes the flow continuously, and the data for each month is the difference between the reading at the start and end of the month.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The data management system has been set up in accordance with monitoring plan of PDD. The correct transfer of data is assured by internal control process. The emission reductions are calculated using Excel worksheet, and the embedded formulas are transparent and have been tested using the data in PDD. The QA/QC processes have been followed.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in	Not applicable

accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of PDD):	$EG_{AUX\text{-}selfused}$ (M13-1 & M13-2 , M14)
Measuring frequency:	Continuously
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Energy meter
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	Yes
Calibration frequency /interval:	Once per year
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Yes
Company performing the calibration:	Anshan Institute of Measurement
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is (are) calibration(s) valid for the whole reporting period?	Calibrated by Anshan Institute of Measurement dated 27 October 2009 and valid for one year.
If applicable, has the reported data been cross-checked with other available data?	The value has been cross-checked with data from operation records/7/
How were the values in the monitoring report verified?	The daily records were reviewed, and $EG_{AUX\text{-}selfused}$ was verified by calculating the difference between meter readings at the start and end of each month
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The data management system has been set up in accordance with monitoring plan of PDD. The correct transfer of data is assured by internal control process. The emission reductions are calculated using Excel worksheet, and the embedded formulas are transparent and have been tested using the data in PDD.

	The QA/QC processes have been followed.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable

3.6 Assessment of data and calculation of emission reductions

The emission reductions ER_y by the project activity during the crediting period is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

1) Baseline emissions: Baseline emissions (BE_y) are the product of the baseline emissions factor (in tCO_2/MWh) times the electricity supplied by the project activity (EG_y in MWh). Baseline emissions are given as:

$$BE_{electricity,y} = EG_y \times EF_{electricity,y}$$

Where:

EG_y	Net quantity of electricity supplied to the manufacturing facility by the project during the year y in MWh.
$EF_{eletricity,y}$	CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y, which is fixed ex ante as 1.0027 tCO_2e/MWh for the whole crediting period according to registered PDD /13/ and has been verified in validation report /14/.

The net quantity of electricity supplied is determined by subtracting the quantity of electricity sourced from the back-up line from the steel plant (internal electricity consumption in emergencies) (M14) and auxiliary consumption of the power plant (M13-1 and M13-2) from total electricity generated in the project plant (M10), which have been monitored and determined during the current monitoring period.

2) Project emissions: steam is used for a complete start-up when the whole power generation unit has been shut down and there is no internal steam production in the power station. Therefore, the project emissions result from the fossil fuels which are used to generate the start-up steam. By monitoring the amount of start-up steam, the project emissions are obtained using the following formula,

$$PE_y = Q_{Coal} \times NCV_{Coal} \times EF_{CO2,Coal} \times OXID_{Coal} = \frac{Q_{steam} \times H_{steam}}{\eta_{boiler}} \times EF_{CO2,Coal} \times OXID_{Coal}$$

$PE_{y,}$	Project emissions in year y (tCO_2);
Q_{Steam}	Mass unit of steam consumed for start-up (tonnes);
H_{Steam}	Enthalpy of start-up steam, conservative figure at designed condition in the registered PDD is 3.1386 GJ/tonnes;

η_{boiler}	Conservative boiler efficiency, = 50% (in registered PDD);
$EF_{CO2, Coal}$	CO_2 emissions factor per unit of energy of the coal, 0.0946 (tCO_2/GJ) from IPCC. Selection of the IPCC default value is justified since local values are not available and there is no country-specific National data available in China.
$OXID_{Coal}$	Oxidation factor of the fuel coal (%), = 100%;

DNV has verified the H_{Steam} (3.1386 GJ/tonnes) from the "Thermal Engineering Manual" /15/ and boiler efficiency (η_{boiler} = 50%) to be conservative as compared with the average operation efficiency of boilers in China (60 – 65% based on the IPCC report /17/).

3) Leakage: No leakage has to be considered for the proposed project activity. This is as per the applied methodology ACM0004, version 2.

4) Emission reduction: $ER_y = BE_y - PE_y - L_y$

The combined margin of 1.0027 tCO_2e/MWh is fixed *ex-ante* for the whole crediting period as per the registered PDD /13/ and has been verified from the validation report /14/.

Based on the above mentioned net electricity supply and the *ex-ante* fixed grid emission factor of 1.0027 tCO_2e/MWh, the emission reductions from the project activity has been verified to be 1 136 946 tCO_2e for the period from 1 March 2010 to 30 September 2010. DNV is able to confirm that the actual net quantity of electricity supplied is 11.47% higher than that projected in the PDD for 214 days (1 March 2010 to 30 September 2010). The reason for the difference is as follows:

- The waste gas demand for other utilizations is higher in winter in the area of the project and the availability of the waste gas for the project is relatively lower. The monitoring period is 1 March 2010 to 30 September 2010 which results in a higher availability relatively.
- There is no planned overhaul during the current monitoring period/7/.

DNV also compare the actual emission reductions from 1 September 2009 to 30 September 2011 (including this monitoring period and the previous monitoring period). The actual emission reduction from 1 September 2009 to 30 September 2011 is 1 791 739 tCO_2e, which is 4.83% lower than the estimated value (1 882 706 tCO_2e for 395 days) in the same monitoring period.

So DNV confirms that the difference between the actual emission reduction in the monitoring period and the estimated value in the registered PDD is reasonable.

The ER calculation /3/ is complete and transparent, and DNV was able to confirm the accuracy.

3.7 Quality of Evidence to Determine Emission Reductions

The electricity meters for measuring the electricity generated, electricity consumed and imported from Anshan Iron and Steel Group Corporation have been installed. The permissible limit for the meter is 0.5% accuracy class. Electricity data are monitored continuously and

record taken by the operators every four hours. This is the basis for emission reduction calculations. The meters for monitoring parameters for determining Q_{steam}, (including pressure meter, flow meter, thermometer and orifice plate) are also installed as defined in the registered PDD. All the meters are calibrated by the qualified independent organization - Anshan Institute of Measurement. Calibration certificates have been checked during on site visit /5/ /6/. The calibration certificate of all electricity meters /5/ have been verified by DNV. Therefore, DNV is able to confirm the emission reduction reported for this monitoring period is reasonable and accurate.

3.8 Management System and Quality Assurance

The management system for the CDM project is in place, i.e. the organization structure with the responsibilities has been properly identified and is in place.

The monitoring and reporting of electricity generation data is in accordance with well established operational procedures. The person in charge of the operation of the power station is responsible for data collection and recording. There is a daily recording and the data is double checked by supervisor. Monthly electricity generation data are also checked and reported to CAMCO International Limited. DNV is able to verify that QA/QC procedures for reported data and calculations are generally adequate.

4 CERTIFICATION STATEMENT

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions that have been reported for the "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" in China (UNFCCC Registration Ref. No. 1609) for the period of 1 March 2010 to 30 September 2010.

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project.

It is DNV's responsibility to express an independent verification statement on the reported GHG emission reductions from the project. DNV does not express any opinion on the selected baseline scenario or on the validated and registered PDD.

DNV conducted the verification on the basis of the monitoring methodology ACM0004 (version 2), the monitoring plan contained in the registered Project Design Document of 27 November 2008 and the monitoring report (version 2) dated 21 July 2011. The verification included

i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

DNV's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions of the "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" in China (UNFCCC Registration Ref. No. 1609) for the period 1 March 2010 to 30 September 2010 are fairly stated in the monitoring report (version 2) dated 21 July 2011.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology ACM0004 (version 2) and the monitoring plan contained in the registered Project Design Document of 27 November 2008.

DNV Climate Change Services AS is able to certify that the emission reductions from the "Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project" in China during the period 1 March 2010 to 30 September 2010 amount to 1 136 946 tonnes of CO_2 equivalent.

Beijing and Oslo, 5 Augst 2011,

Zhiang Tang

Tang Zhiang
Verifier

Edwin Aalders
Director for Services and Technologies
DNV Climate Change Services AS

5 REFERENCES

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

/1/ Monitoring report of Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project, version 1, 18 October 2010 and version 2, 21 July 2011.

/2/ CDM Monitoring Manual issued by Anshan Iron and Steel Group Corporation (Anshan) dated January 2009.

/3/ Spreadsheet for emission reduction calculation of this project during the monitoring period from 1 March 2010 to 30 September 2010.

/4/ Power purchasing agreement between power plant and Anshan Iron and Steel Group Corporation (Anshan) dated 1 March 2009

/5/ Calibration certificates for electricity meters, pressure meter, flow meter, thermometer and orifice plate issued by Anshan Institute of Measurement dated 27 October 2009.

/6/ Certificate of metrological authorization to Anshan Institute of Measurement for the electricity meters' calibration, dated 4 January 2006 to 3 January 2011 validated for 5 years

/7/ Operation records on electricity generation of Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project from March 2010 to September 2010.

/8/ The internal and external training records for the operation, data monitoring, reading, recording, storage and ER calculation.

/9/ Power plant commissioning report issued by Northeast electric power science institute dated 20 October 2007

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

/10/ Verification reports for 1st monitoring period (26 October 2009, version 1), 2nd monitoring period (9 November 2009, version 1) and 3rd monitoring period (14 May 2010, version 2) issued by DNV

/11/ CDM Executive Board: Validation and Verification Manual Version 01.2. http://cdm.unfccc.int/EB/044/eb44_repan03.pdf

/12/ Consolidated baseline and monitoring methodology for waste gas and/or heat and/or pressure for power generation" ACM0004 (version 2).

/13/ Registered project design document dated 27 November 2008.

/14/ Project's validation report by TUV SUD dated 28 November 2008.

/15/ "Thermal Engineering Manual" published by Chemical Industry Publisher 1998

/16/ Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories

/17/ IPCC report on boiler efficiency: http://www.ipcc.ch/ipccreports/sres/tectran/181.htm

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APPENDIX A

CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUESTS

Corrective action requests from this verification

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 1	In page 7 of published monitoring report, it mentions that "Data are archived using both electronic and paper records until 2 years following the end of the monitoring period", which is not line with EB's requirements.	The statement in the published monitoring report is a mistake, which use the wrong word "monitoring" instead of "crediting". The data collected so far have been archived properly and will be archived using both electronic and paper records until 2 years following the end of the crediting period. The mistake has been corrected in the revised MR.	OK It is revised in the latest monitoring report version 2 dated 21 July 2011. The CAR is closed

Clarification requests from this verification

CL ID	Clarification request	Summary of how CL has been addressed in this reporting period	Assessment of how CL has been addressed
CL 1	The emission reductions during the current monitoring period are higher than the estimated emission reductions in the registered PDD. The reasons need to be identified with evidences.	The reasons on the significant increase for the emission reductions during the current monitoring period are clarified in the latest monitoring report with the evidences	OK DNV is able to confirm the actual emission reduction (1 136 946 tonnes of CO_2) is 11.47% more than those in the PDD (1 019 998 tonnes of CO_2) in the monitoring period. The reason for the difference is as follows: - The waste gas demand for other utilizations is usually higher in winter in the area of the project and the availability of the waste gas for the project is relatively lower. The monitoring period is 1 March 2010 to 30 September 2010 which results in a higher availability relatively. - This is not planned overhaul during the current monitoring period/7/. DNV also compare the actual emission reductions from 1 September 2009 to 30 September 2011 (including this monitoring period and the previous monitoring period). The actual emission reduction from 1 September 2009 to 30 September 2011 is 1 791 739 tCO_2e, which is 4.83% lower than the estimated value (1 882 706 tCO_2e for 395 days) in the same monitoring period. So DNV confirms that the difference between the actual emission reduction in the monitoring period and the estimated value in the registered PDD is reasonable. The CL is closed

Forward action requests from this verification

No FARs have been raised during this verification.

APPENDIX B

CURRICULA VITAE OF THE VERIFICATION TEAM MEMBERS

Zhi Ang (Walter) Tang

Mr. Tang Zhiang, Walter holds a Bachelor Degree in Thermodynamic Engineering and a Master Degree in Business Administration. Having an overall experience of around twelve years. Prior to joining DNV, having around 5 years in the field of power industry covering of consulting and engineering for thermal power, wind power, hydropower and solar energy projects. His experience also covers the field of space industry for thermal design, the energy analysis and thermal control for about 4 years.

He has gained the relevant financial and investment knowledge through his courses in MBA. He has applied his financial and investment knowledge in his consulting work for the power industry, such as investment risk analysis, financial accounting, investment parameters assessment, etc.

He has experience of more than 3 years in validation and verification of numerous CDM, VCS and GS projects in DNV both in China and abroad.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in “Energy Generation from Renewable Energy Sources”.

Xiao Jun(Johnsen) Zhang

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

For financial analysis and investment, he has gained the relevant knowledge through his MBA course; and through the feasibility case study in the iron and steel sector while he worked as management personnel, he gradually gained concerted experience in cost accounting, financial analysis and investment input parameter assessment.

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

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

Luis Filipe Tavares

Mr. Luis Filipe Tavares holds a Technician's Degree in Chemistry and Bachelor's Degree in Metallurgical Engineering. Having an overall experience of thirty tree years.

Prior to joining DNV having around twenty tree years experience in steel production industry covering utilities (water, steam, wastewater treatment), environment control (atmosphere emissions, water emission and waste dumping).

His experience also covers the development of nitrification biological wastewater station as well as other activities as head of Utilities and Environmental Laboratory control.

He has also been actively involved in implementation of Management Systems such as ISO 9001 standard on coke oven department of steel industry as well as the ISO 140001 standard in all steel plant (the second steel company certified in the world) for more than three years.

He has experience of around 8 years in validation and verification of numerous CDM projects in DNV, both in Brazil and South America.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in Iron and Steel; Metal production; Oil and Gas industry, CMM recovery and use; Generation from renewable energy sources; Waste handling and disposal and Animal waste management.

Bao Jun Hou

Mr. 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".

Ole Andreas Flagstad

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

Ole Andreas Flagstad has 4 years experience in validation and verification of projects within CDM, JI and other carbon credit schemes. His qualifications and experience in carbon credit

schemes (primarily CDM and JI), qualifies him for different roles in a broad group of technical areas.

Alexander Osadchiev

Mr. 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 and abroad.

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

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