MONITORING REPORT FORM (CDM-MR)
Version 01 - in effect as of: 28/09/2010

CONTENTS

MONITORING REPORT
Version number: 2.0
Date: 21/07/2011

Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project
Reference number: 1609
The 4th monitoring period: 01/03/2010-30/09/2010

SECTION A. General description of the project activity

A.1. Brief description of the project activity:

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The Anshan Iron and Steel Group Corporation (Anshan) Blast Furnace Gas Combined Cycle Power Plant Project (hereafter referred to as "the project") designed, constructed and operated 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. By generating electricity using the waste gas, 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.

With the major technology imported, the project installed 1 unit of 300 MW combined cycle generation unit. The whole process is composed of gas supply system, gas turbine generation system and steam turbine generation system.

The project began to construct in March, 2005, and completed final commissioning in October 2007. The project has been registered as a CDM project on 03/12/2008 (The version of registered PDD is version 5). During current monitoring period (01/03/2010-30/09/2010), the project has achieved 1,136,946 tonnes of CO_2e.

A.2. Project Participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Party involved wishes to be considered as project participant (Yes/No)
China (Host)	**Anshan Iron and Steel Group Corporation**	**No**
United Kingdom of Great Britain and Northern Ireland	**NATIXIS Environnement & Infrastructures**	**No**
United Kingdom of Great Britain and Northern Ireland	**Camco International Limited**	**No**
United Kingdom of Great Britain and Northern Ireland	**European Carbon Fund**	**No**
Switzerland	**Camco International Limited**	**No**

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

A.3. Location of the project activity:

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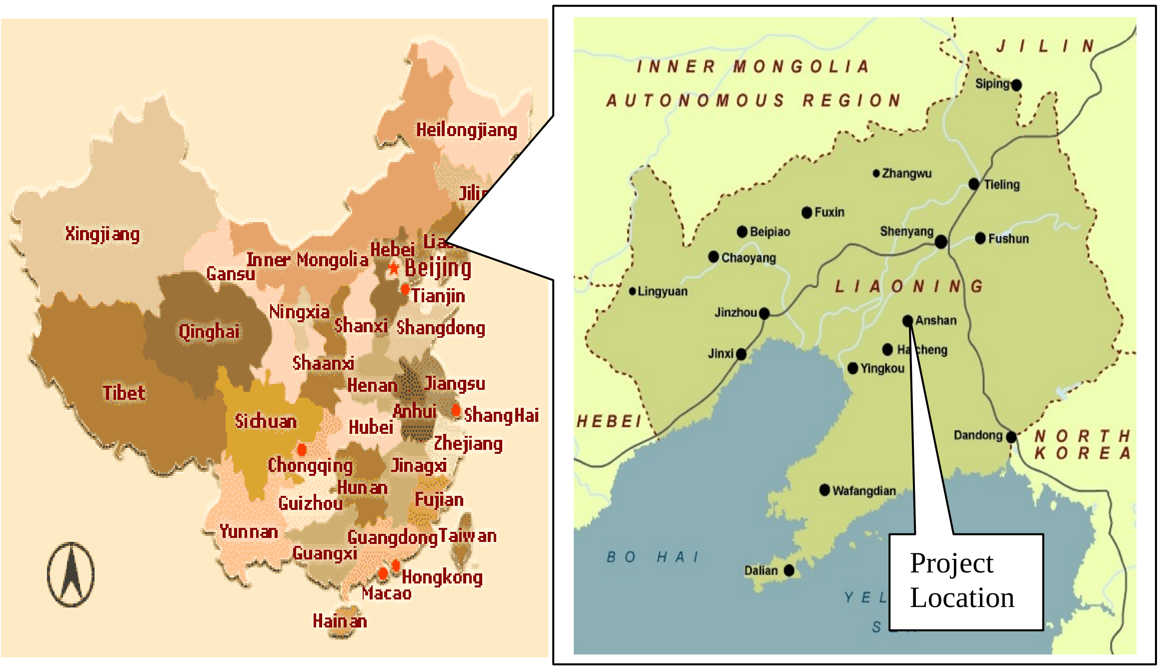
The proposed project is located in within Anshan Iron and Steel Group Corporation in Tiexi District, Anshan City, Liaoning Province, P.R. China. The geographic co-ordinates are east longitude 122° 58′ 03″, north latitude 41° 08′ 59″ N.

Please refer to the following drawing for the geographic location of the project activity.

Figure 1: Location of the proposed project in China



A.4. Technical description of the project

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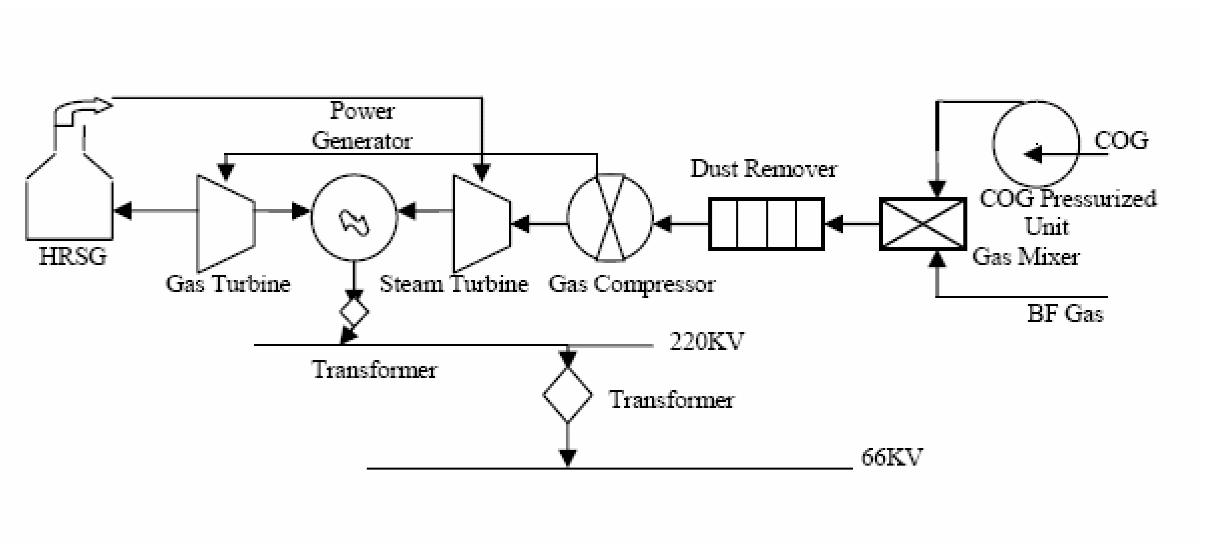
The project installed one set of 300 MW combined cycle generation unit, the total combined capacity of gas turbine and steam turbine is 300 MW and the generator capacity is 300 MW. The whole process is composed of gas supply system, gas turbine generation system and steam turbine generation system, as shown in the following diagram.

Figure 2: Schematic of key technology employed by project activity



The waste gas is supplied to the gas turbine after removing the dust and combusted in the gas turbine to generate power. The high temperature flue gas from the gas turbine is supplied to heat recovery boiler to generate steam, which is used by steam turbine to generate power. The output voltage of generator is 16.5 kV, which is transformed to 220kv, thereafter, delivered to facility.

Compared with normal thermal power plants, the efficiency of Combined Cycle Power Plants (CCPPs) is much higher, and could reach above 44%.

Besides of contribution to GHG emission reduction, the proposed project could also contribute to global and local sustainable development from the following aspects:

- Reduce air pollutants of coal fired power plants such as SO_2 and particulates;
- Reduce consumption of fossil energy thus decreases exploration and consumption of fossil resources;
- Be helpful to improve energy mix and energy security;
- Create 152 employment opportunities for local community;
- Prompt the spread and deployment of blast furnace gas CCPP technology.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

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The methodology applied to the Project is "Consolidated baseline and monitoring methodology for waste gas and/or heat and/or pressure for power generation" ACM0004 (version 2) (http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_XIXYIGMQQIJ65GY3UJCP3R90X4TG75).

ACM0004 also refers to methodology ACM0002 'Consolidated baseline methodology for grid-connected electricity generation from renewable sources' (version 6) (http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_BW759ID58ST5YEEV6WUCN5744MN763)

The 'Tool for the demonstration and assessment of additionality (version 3)' is also applied to the Project as required by the methodology ACM0004. (http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf).

A.6. Registration date of the project activity:

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03/12/2008

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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Crediting period: 03/12/ 08 – 02/12/18 (Fixed)

A.8. Name of responsible person(s)/entity(ies):

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SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

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The project consists of one site and has been implemented as described in the registered PDD. The construction of the project started in March, 2005, and the implementation status of CCPP is detailed in the following table:

Table 1 Project activity milestones

Date	Work
March 2005	Ground Breaking
November 2006	Installed auxiliary equipments
April 2007	Installed core equipment
July 2007	Start operation-testing
October 2007	Final commissioning

During current period, the project has been operating normally as described in the registered PDD. There have been no other special events in addition to six unplanned shutdowns for the CCPP unit due to defects in some auxiliary systems.

B.2. Revision of the monitoring plan

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N/A

B.3. Request for deviation applied to this monitoring period

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N/A

B.4. Notification or request of approval of changes

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N/A

SECTION C. Description of the monitoring system

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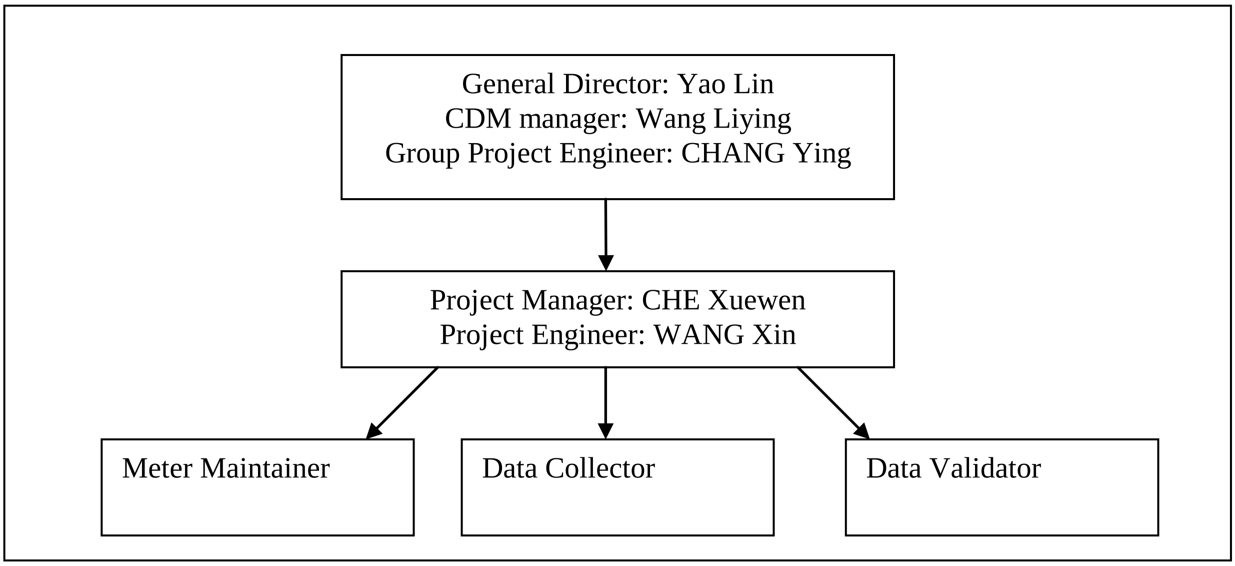
1. The organizational structure, roles and responsibilities of personnel:

The operational and management structure of the project and the key responsibilities of individuals are as follows:

- Ultimate responsibility for the project rests with Mr Yao Lin, General Director

- Ms. Wang Liying, Director of development and planning department, is in charge of the operation of the CDM project
- The Group Project Engineer, Mrs. Chang Ying, and Project Manager, Mr Che Xuewen, are responsible for implementing the project
- The nominated CDM responsible person for the project is Mr. Wang Xin who is responsible for monitoring plan implementation.

Figure 3 Organizational structure of the CDM office



2. Data collection procedures:

All the data recording were developed in accordance with the monitoring plan and company's management procedures on daily and monthly basis. All the records and reports were signed and collected to the CDM Manager by responsible persons. Data are archived using both electronic and paper records until 2 years following the end of the crediting period.

The electricity supplied to the facility by the project is monitored with the monitoring system as shown in figure 4.

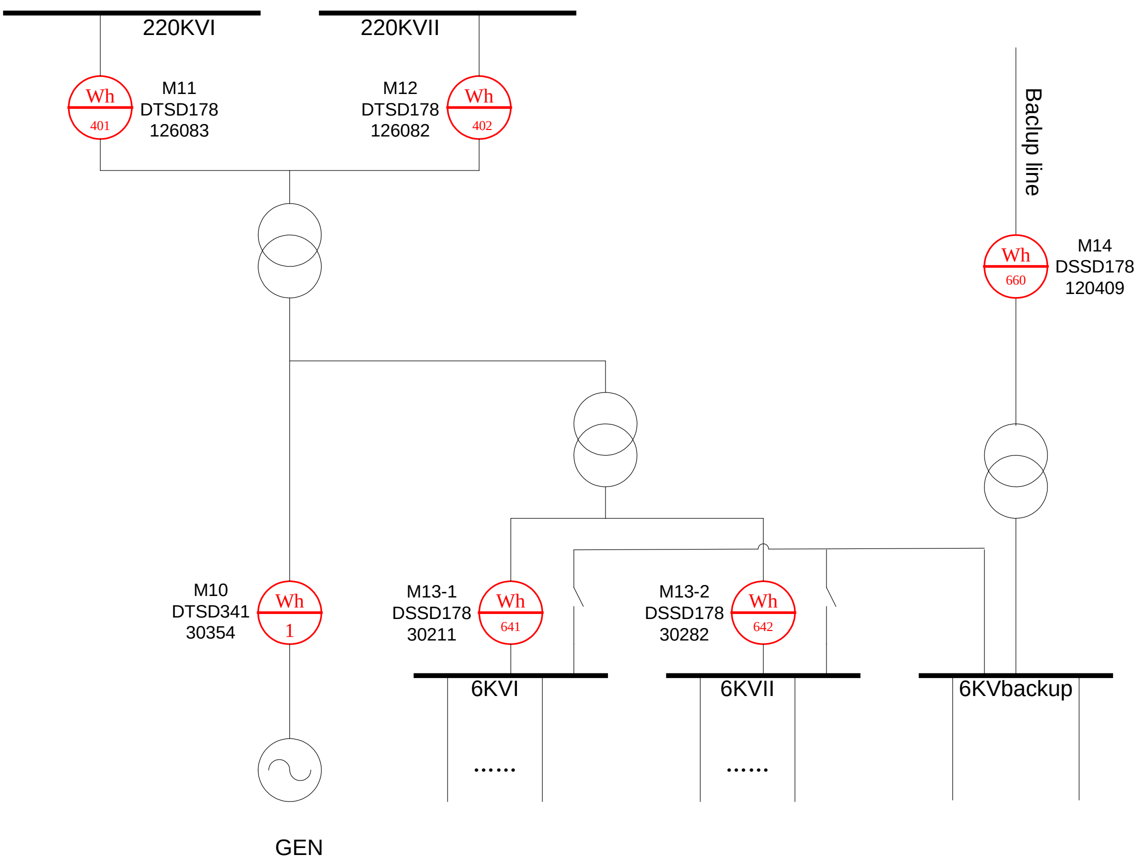
Primary monitoring system:

$$EG_Y = EG_{GEN} - EG_{AUX} = M_{10} - M_{13-1} - M_{13-2} - M_{14} \quad (1)$$

Backup monitoring system:

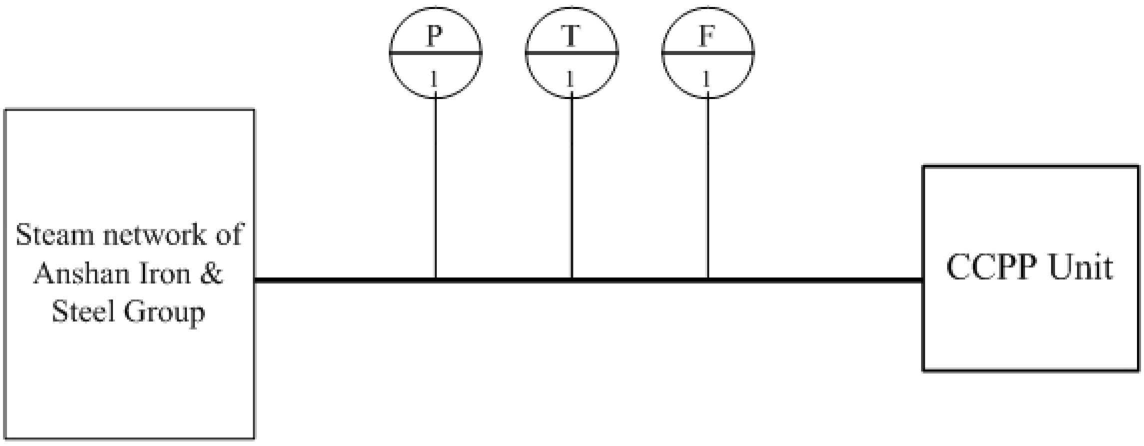
$$EG_Y = EG_{GEN} - EG_{AUX} = M_{11} + M_{12} - M_{14} \quad (2)$$

Figure 4: the monitoring system of Net Electricity Generated



Steam used in start up is monitored with the following system:

Figure 5: the monitoring system of Auxiliary Steam Used in Start Up



Monitoring system for start-up steam

3. Data aggregation, recording, calculation and reporting

The data collector is responsible for collecting the readings of measured parameter listed in section D.2 regularly, following the prescribed frequency, and submit the results to data validator.

The data validator checks the validity of the data by comparing with previous recorded data and data from third party such as the Power Corporation. If a big difference does exist, it should be reported to director of the workgroup by the data validator.

The validated data is input to CDM data management system by the data validator to be archived by electronic means.

The meter maintainer is responsible for calibration and regular maintenance of the meters. The meters are calibrated and maintained by specific technical staff and third party following relevant regulation and standards.

The project owner entrusts professional organization to prepare monitoring report. The monitoring report and emission reductions are reviewed and approved by the CDM manager before submitted to DOE.

All the data record is kept for a period of 2 years after the crediting period.

4. Emergency procedures for the monitoring system

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.

In the event that there is uncertainty over the accuracy of the data set from the main meter (e.g. the meter has lost calibration over the acceptable error limit), then the data from the secondary meter shall be used.

SECTION D. Data and parameters

1. Data monitored

In accordance with the applicable methodology ACM0004 version 2, parameters to be monitored are:

For baseline emissions: EG_{GEN}, EG_{AUX}, and EGy
For project emissions: Q_i, NCV_f, EF_i
For leakage: No parameters required

a) Parameters for baseline emissions

EG_{GEN}, EG_{AUX}, and EGy have been monitored in accordance with ACM0004 version 2.

b) Parameters for project emissions

As requested in ACM0004 version 2, "Project Emissions are applicable only if auxiliary fuels are fired for generation startup, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery Boiler."

In the case of the Project, no auxiliary fuels are directly fired within the CCPP power plant for any reason, while only steam is used for generation startup. As described in the PDD, the steam used for start-up is supplied by existing power plant of AISG, which consists of many boilers fuelled by a mix of coal and BFG. Thus, coal and BFG can be seen as auxiliary fuel of the proposed project. If BFG was not used in the proposed project as auxiliary fuel, it would be flared to the atmosphere. Based on this point, the emission from combustion of BFG in the project is not considered. Therefore, for conservativeness, it will be assumed that all steam is generated from coal and hence project emission is from coal fired. Therefore, project emissions should be calculated as:

$$PE_y = Q_{Coal} \times NCV_{Coal} \times EF_{CO2,Coal} \times OXID_{Coal}$$

Where,

PE_y	Project emissions in year y (tCO_2);
Q_{Coal}	Mass or volume unit of coal consumed (t)；
NCV_{Coal}	Net calorific value per mass or volume unit of coal (GJ/t);
$EF_{CO2,\ Coal}$	CO_2 emissions factor per unit of energy of the coal；
$OXID_{Coal}$	Oxidation factor of the fuel coal;

Since the steam comes from a steam network, it is unlikely to locate the exact boiler that produces the steam used for power generation startup. Therefore, fossil fuel consumption for steam generation cannot be directly monitored.

In the registered PDD, a conservative method to monitor/calculate the project emissions is given as follows by monitoring the steam continuously:

$$PE_y = Q_{Coal} \times NCV_{Coal} \times EF_{CO2,Coal} \times OXID_{Coal} = \frac{Q_{steam} \times H_{steam}}{\eta_{boiler}} \times EF_{CO2,Coal} \times OXID_{Coal} / 1000$$ [1]

Where,

PE_y	Project emissions in year y (tCO_2);
Q_{Coal}	Mass or volume unit of coal consumed (t)；
NCV_{Coal}	Net calorific value per mass or volume unit of coal (GJ/t);
Q_{Steam}	Mass unit of steam consumed for start-up (ton)；
H_{Steam}	Enthalpy of start-up steam, (conservative figure at designed condition in PD is 3138.6 MJ/ton = 3.1386 GJ/ton);
η_{boiler}	Conservative boiler efficiency, = 50% (PDD Version 5)；
$EF_{CO2,\ Coal}$	CO_2 emissions factor per unit of energy of the coal, = 0.0946 (t CO_2/GJ) from IPCC；
$OXID_{Coal}$	Oxidation factor of the fuel coal (%), = 100%;

Assessment of the monitoring approach adopted by the project

PE_y	The calculation is based on energy conservation law;
Q_{Steam}	Meter calibrated in accordance with national standards, and accuracy of 1% assured；
H_{Steam}	Conservative figure at designed condition in PDD is 3138.6 MJ/ton = 3.1386 GJ/ton, and crosschecked with operation data to make sure the highest H_{steam} is used for calculating the project emissions;
η_{boiler}	Conservative boiler efficiency, = 50% (PDD Version 5); the lowest design efficiency of the boilers within the steam network is 89.66%. As a proof to the conservativeness of η_{boiler}, please refer to IPCC report about the operation efficiency of industrial boilers in China: http://www.ipcc.ch/ipccreports/sres/tectran/181.htm
$EF_{CO2,\ Coal}$	CO_2 emissions factor per unit of energy of the coal, = 0.0946 (t CO_2/GJ) from IPCC；
$OXID_{Coal}$	Oxidation factor of the fuel coal (%), = 100%;

Based on the assessment of each parameters involved, the monitoring approach adopted by the project activity is conservative and complete as it can address all the monitoring uncertainties.

Compliance with the applicable methodology ACM0004 version 2

The monitoring plan as described in the registered PDD is in compliance with ACM0004 version 2, as:

- The project emissions required by ACM0004 version 2 has been monitored in a conservative way

[1] To simplify the calculation, the energy contained in the feedwater is ignored. This is conservative.

- The level of accuracy and completeness in the monitoring and verification process are not reduced with the adoption of the conservative approach.
- This conservative approach has been used by other CDM projects using ACM0004 version 2 and validated by DOEs.

The data monitored are given in the following table on a monthly basis, and details about each parameter are given in D.2.

Table 2: Net electricity supplied to facility and steam used for start-up

Monitored parameters used for emission reductions calculation 1-Mar-10 -------- 30-Sep-10								
Operation Period			**Net Electricity supplied to the consumer (EGy = M_{10} - M_{13-1} - M_{13-2} - M_{14})**					**Steam consumption (Q_{steam})**
			Metered by M_{10}	**Metered by M_{13-1}**	**Metered by M_{13-2}**	**Metered by M_{14}**	**EG_Y**	
Month	Start Date	End Date	MWh	MWh	MWh	MWh	MWh	Tons
Mar	1-Mar-10	31-Mar-10	89,433.60	2,096.64	1,867.68	247.50	85,221.78	556.80
Apr	1-Apr-10	30-Apr-10	153,168.00	2,824.32	1,473.84	146.52	148,723.32	589.50
May	1-May-10	31-May-10	165,744.00	2,638.80	1,850.64	170.28	161,084.28	602.50
Jun	1-Jun-10	30-Jun-10	197,006.40	2,327.76	2,522.16	67.32	192,089.16	0.00
Jul	1-Jul-10	31-Jul-10	190,440.00	2,192.64	2,982.00	73.26	185,192.10	0.00
Aug	1-Aug-10	31-Aug-10	203,414.40	1,992.00	3,321.12	71.28	198,030.00	0.00
Sep	1-Sep-10	30-Sep-10	170,836.80	1,741.44	2,566.08	550.44	165,978.84	2,362.70
Total			1,170,043.20	15,813.60	16,583.52	1,326.60	1,136,319.48	4,111.50

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors	
Data / Parameter:	$EF_{CO2,Coal}$
Data unit:	t CO_2/GJ
Description:	CO_2 emission factor per unit of energy of the coal.
Source of data used:	IPCC 2006
Value(s) :	0.0946
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculation
Additional comment:	

Data / Parameter:	$OXID_j$
Data unit:	%
Description:	Oxidation factor of coal
Source of data used:	IPCC 2006
Value(s) :	100%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculation
Additional comment:	

Data / Parameter:	η_{boiler}
Data unit:	-
Description:	Boiler efficiency
Source of data used:	IPCC
Value(s) :	50%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculation
Additional comment:	Conservative figure lower than design (90.5%) and the average operation efficiency of boilers in China, which is 60 – 65% (IPCC report: http://www.ipcc.ch/ipccreports/sres/tectran/181.htm)

Data / Parameter:	H_{steam}
Data unit:	MJ/t
Description:	Steam enthalpy
Source of data used:	PDD version 5
Value(s) :	3,138.6
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculation
Additional comment:	At design condition (2 MPa & 350°C), which is higher than enthalpy during normal operation conditions

Data / Parameter:	$EF_{electricity, y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y

Source of data used:	PDD version 5
Value(s) :	1.0027
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Additional comment:	Fixed ex-ante in PDD

D.2. Data and parameters monitored	
Data / Parameter:	EG_{GEN}
Data unit:	GWh
Description:	Total electricity generated by the project
Measured /Calculated /Default:	Measured
Source of data:	On-site measurement by power meter at project activity site
Value(s) of monitored parameter:	The monitored electricity generated is 1,170.04320 GWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The meter has been calibrated annually by Anshan Bureau of Quality and Technical Supervision (Certificate No. (Liao) Faji (2006）004). Meter Name: M_{10} Type: DTSD341 Accuracy class: 0.5 Serial number: 30354 Frequency: Once per year Date of last calibration: 27-Oct-09 Expiry: 26-Oct-10
Measuring/ Reading/ Recording frequency:	Continuous measurement and monthly recording
Calculation method (if applicable):	N/A
QA/QC procedures applied:	The accuracy of the power meter is no less than 0.5. The meters and DCS system are regularly maintained following the relevant Chinese regulation and standards.

Data / Parameter:	Q_i
Data unit:	Tonnes
Description:	Volume of steam used by project activity for complete start-up (i.e. when both the turbines have been shut down and there is no internal steam production in the power plant). The steam used for start-up is supplied by existing captive power plant of AISG
Measured /Calculated /Default:	Measured

<table>
<tr><td>Source of data:</td><td>daily records of on-site measurements</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>The monitored steam for start-up is 4,111.5 tonnes</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>For project emission calculation.</td></tr>
<tr><td>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</td><td>The meters have been calibrated annually by Anshan Bureau of Quality and Technical Supervision (Certificate No. (Liao) Faji (2006）004).
<table>
<tr><th>Meter Name</th><th>Orifice</th><th>Flow</th><th>Pressure</th><th>Temperature</th></tr>
<tr><td>Type</td><td>130-248</td><td>D-76181</td><td>GP8S</td><td>E</td></tr>
<tr><td>Accuracy class</td><td>1</td><td>0.2</td><td>0.5</td><td>Class B</td></tr>
<tr><td>Serial number</td><td>1-3#</td><td>01#</td><td>C996</td><td>01#</td></tr>
<tr><td>Frequency</td><td>Once per year</td><td>Once per year</td><td>Once per year</td><td>Once per year</td></tr>
<tr><td>Date of last calibration</td><td>27-Oct-09</td><td>27-Oct-09</td><td>27-Oct-09</td><td>27-Oct-09</td></tr>
<tr><td>Expiry</td><td>26-Oct-10</td><td>26-Oct-10</td><td>26-Oct-10</td><td>26-Oct-10</td></tr>
</table></td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>Continuous measurement and monthly recording</td></tr>
<tr><td>Calculation method (if applicable):</td><td>N/A</td></tr>
<tr><td>QA/QC procedures applied:</td><td>The meters are regularly maintained following the relevant Chinese regulations and standards. In case of meter failure, the number of complete start-ups and actual volume of steam used for start-up is recorded and a conservative factor of 3979 t CO_2 per start-up applied</td></tr>
</table>

Data / Parameter:	$EG_{AUX\text{-}selfused}$
Data unit:	GWh
Description:	Electricity consumed by the auxiliary equipments of the project.
Measured /Calculated /Default:	Measured
Source of data:	On-site measurement by power meters at project activity site
Value(s) of monitored parameter:	The monitored electricity consumed is 33.72372 GWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	For baseline emission calculation.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The meters have been calibrated annually by Anshan Bureau of Quality and Technical Supervision (Certificate No. (Liao) Faji (2006）004).

Meter Name	M_{13-1}	M_{13-2}	M_{14}
Type	DSSD178	DSSD178	DSSD178
Accuracy class	0.5	0.5	0.5
Serial number	30211	30282	120409
Frequency	Once per year	Once per year	Once per year
Date of last calibration	27-Oct-09	27-Oct-09	27-Oct-09
Expiry	26-Oct-10	26-Oct-10	26-Oct-10

Measuring/ Reading/ Recording frequency:	Continuous measurement and monthly recording
Calculation method (if applicable):	$EG_{AUX-Selfused} = M_{13-1} + M_{13-2} + M_{14}$
QA/QC procedures applied:	The accuracy of the power meters is no less than 0.5. The meters are regularly maintained following the relevant Chinese regulations and standards.

Data / Parameter:	EG_y
Data unit:	GWh
Description:	Net Electricity supplied to facility
Measured /Calculated /Default:	Calculated
Source of data:	Calculated from EG_{GEN} and $EG_{AUX\text{-}Selfused}$
Value(s) of monitored parameter:	The monitored net electricity generated is 1,136.31948 GWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	For baseline emissions calculation.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Since it is a calculated parameter, the meters information could be found in the former tables
Measuring/ Reading/ Recording frequency:	Continuous measurement and monthly recording
Calculation method (if applicable):	Primary monitoring system: $EG_y = EG_{GEN} - EG_{AUX-Selfused} = M_{10} - M_{13-1} - M_{13-2} - M_{14}$ Secondary monitoring system: $EG_y = M_{11} + M_{12} - M_{14}$
QA/QC procedures applied:	The accuracy of the power meters is no less than 0.5. The meters are regularly maintained following the relevant Chinese regulations and standards.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

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Baseline emissions are given as:

BEy $= BE_{electricity,y} = EG_y \times EF_{electricity,y}$ (3)

Where:

EG_y	Net quantity of electricity supplied to the manufacturing facility by the project during the year y in MWh,
$EF_{electricity,y}$	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.

According to the monitoring records during the 4th monitoring period, the net electricity supplied to the facility is:

$EG_y = EG_{GEN} - EG_{AUX-Selfused} = M_{10} - M_{13-1} - M_{13-2} - M_{14}$ =1,170,043.20MWh-15,813.60 MWh -16,583.52 MWh -1,326.60 MWh =1,136,319.48 MWh (4)

BEy = 1,136,319.48 MWh * 1.0027 tCO_2e /MWh = 1,139,388 tCO_2e

Details about baseline emissions calculation can also be found in the Emission Reductions Calculation Spreadsheet.

E.2. Project emissions calculation

>>
As per the methodology ACM0004, Project Emissions are applicable only if auxiliary fuels are fired for generation start-up, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery.

According to ACM0004 V2, Project Emissions are given as:

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i \quad (5)$$

Where:

PE_y	Project emissions in year y (tCO_2);
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);
EFi	Carbon emissions factor per unit of energy of the fuel i (tC/TJ)；
$OXID_i$	Oxidation factor of the fuel i (%)

In terms of the project, 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 CCPP power plant. Therefore, the project emissions are resulted from the fossil fuels which are used to generate the start-up steam.

As described in PDD (Version 5), the steam for start-up is from the steam network of the project owner, and the sources of the team network are a combination of boilers. To be conservative, the start-up steam is assumed to be supplied from boilers fueled with the most carbon-intensive fuel (coal in this case) among all the existing boilers. Therefore,

$$PE_y = Q_{Coal} \times NCV_{Coal} \times EF_{Coal} \times \frac{44}{12} \times OXID_{Coal} = Q_{Coal} \times NCV_{Coal} \times EF_{CO2,Coal} \times OXID_{Coal} \quad (6)$$

Where,

PE_y	Project emissions in year y (tCO_2);
Q_{Coal}	Mass or volume unit of coal consumed (t)；
NCV_{Coal}	Net calorific value per mass or volume unit of coal (GJ/t);
EF_{Coal}	Carbon emissions factor per unit of energy of the coal, (tC/GJ)；
$EF_{CO2, Coal}$	CO_2 emissions factor per unit of energy of the coal, = 94,600 kg/TJ = 0.0946 (t CO_2/GJ) from IPCC；
$OXID_{Coal}$	Oxidation factor of the fuel coal (%), = 100%;

By monitoring the amount of start-up steam, the energy amount of coal ($Q_{Coal} \times NCV_{Coal}$) used to generate the start-up steam can be obtained based on energy balance as described in the PDD (Version 5), and the project emissions are obtained using the following formula,

$$PE_y = Q_{Coal} \times NCV_{Coal} \times EF_{CO2,Coal} \times OXID_{Coal} = \frac{Q_{steam} \times H_{steam}}{\eta_{boiler}} \times EF_{CO2,Coal} \times OXID_{Coal} /1000$$

= 4,111.5tonnes x 3,138.6 MJ/ton x 0.0946 t CO_2/GJ x100% / 50% / 1000 = 2,442 t CO_2e (7)

Where,

PE_y	Project emissions in year y (tCO_2);
Q_{Steam}	Mass unit of steam consumed for start-up (ton)；
H_{Steam}	Enthalpy of start-up steam, (conservative figure at designed condition in PD is 3138.6 MJ/ton = 3.1386 GJ/ton);
η_{boiler}	Conservative boiler efficiency, = 50% (PDD Version 5)；
$EF_{CO2, Coal}$	CO_2 emissions factor per unit of energy of the coal, = 0.0946 (t CO_2/GJ) from IPCC；
$OXID_{Coal}$	Oxidation factor of the fuel coal (%), = 100%;

Details about project emissions calculation can also be found in the Emission Reductions Calculation Spreadsheet.

E.3. Leakage calculation

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According to methodology ACM0004 (Version 2), the leakage of the project within the project boundary is zero, i.e. LEy = 0 tCO_2e.

E.4. Emission reductions calculation / table

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The emission reductions achieved is calculated by the below formulae:

ERy = BEy - PEy - LEy = 1,139,388 tCO_2e -2,442 tCO_2e -0 tCO_2e =1,136,946 tCO_2e (8)

Details about emission reductions calculation are shown in the following table on a monthly basis.

Calculation of emission reductions 1-Mar-10 ----------- 30-Sep-10						
A			B	C	D	E
Operation Period			Baseline Emissions	Project Emissions	Leakage	Emission Reductions
Month	Start Date	End Date	(tCO_{2e})	(tCO_{2e})	(tCO_{2e})	(tCO_{2e})
			From BEs	From PEs	From LEs	=B-C-D
Mar	1-Mar-10	31-Mar-10	85,452	331	0	85,121
Apr	1-Apr-10	30-Apr-10	149,125	350	0	148,775
May	1-May-10	31-May-10	161,519	358	0	161,161
Jun	1-Jun-10	30-Jun-10	192,608	0	0	192,608
Jul	1-Jul-10	31-Jul-10	185,692	0	0	185,692
Aug	1-Aug-10	31-Aug-10	198,565	0	0	198,565
Sep	1-Sep-10	30-Sep-10	166,427	1,403	0	165,024
Total			1,139,388	2,442	0	1,136,946

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

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Item	Values applied in ex-ante calculation of the registered CDM-PDD Version 5	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	**1,019,998**[2]	**1,136,946**

E.6. Remarks on difference from estimated value in the PDD

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The emission reductions during the current monitoring period are higher than the estimated emission reductions[3] in the registered CDM - PDD (Version 5), but the actual annual emission reductions are still lower than the values applied in ex-ante calculation of the registered CDM- PDD (Version 5). The relatively higher emission reductions during the current monitoring period are due to operation fluctuation of the project activity.

For waste gas recovery projects, the performance of the project activity fluctuates during a year depending mainly on the following two factors:

- Availability of waste gas (fuel)
- Operation status of major facilities

As the project activity is located in cold area, the waste gas demand for other utilizations is usually higher in winter and lower in other seasons. Since the current monitoring period is from 1 March 2010

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[2] The current monitoring period covers 7 months, while the values in the CDM-PDD are for a whole year. The figure here is obtained for 7 months supposing the electricity generation is distributed evenly over each month.

[3] The estimated emission reductions are obtained for 7 months supposing the electricity generation is distributed evenly over each month. This is not in line with the actual situation of the project activity

to 30 September 2010, the available waste gas for power generation is relatively higher. In terms of operation, the generation unit operates normally without any long unplanned outage or planned maintenance during most of the current monitoring period. As a result, the emission reductions are higher than the last verification.

Considering the operation fluctuation of the project activity, a comparison of actual emission reductions with estimates in the CDM-PDD (Version 5) on a yearly basis is more reasonable. Based on the monitored data of last and current monitoring period, the annual emission reductions is compared, as shown in the following table, with the estimates in the registered CDM - PDD (Version 5).

Item	**Values applied in ex-ante calculation of the registered CDM-PDD Version 5**	**Actual values reached during last 12 months**
Emission reductions (tCO_2e)	**1,739,716**	**1,648,194**

As shown in the above table, the actual annual emission reductions are still lower than the values applied in ex-ante calculation of the registered CDM- PDD (Version 5).

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History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Guideline, Form **Business Function**: Issuance		