

**MONITORING REPORT FORM (CDM-MR)**
Version 01 - in effect as of: 11th June 2010**CONTENTS**

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**MONITORING REPORT**

Ver. 2.0

3rd September 2010**Zhumadian Zhongyuan Gas-Steam Combined Cycle Power Plant in Henan of PRC**

Ref. 2344

25th Aug 2007 to 24th Aug 2009**SECTION A. General description of the project activity****A.1. Brief description of the project activity: >>**

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As described in PDD, the proposed project is a natural gas-fired Combined Cycle Power Plant project. It is located at the southeast corner of Zhumadian City, Henan Province, China. The project started operation in June 2007 and was registered as a CDM project in 25th August 2009. The designed installed capacity of the proposed project is 2×377.2MW, which is aimed to deliver 2,584,423.5MWh electricity annual to the Central China Power Grid (CCPG), which is dominated by coal-fired power plants. The electricity generated can displace electricity generated by coal-fired thermal power plants which would have been built otherwise. The GHG emission reductions in the crediting period are 559,568 tCO₂e.

The crediting period and the emission reductions of this monitoring period are:

Date	ERs (tCO ₂ e)
Jun 4 th 2007	Started operation
Aug 25 th 2007	Crediting period start
Aug 25 th 2007 to Dec 31 st 2007	13,398
Jan 1 st 2008 to Jan 9 th 2009	267,832
Jan 9 th 2009 to Aug 24 th 2009	278,338
Aug 25 th 2009	CDM project registration
Total	559,568

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)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Huaneng Henan Zhongyuan Gas Power Company Ltd.	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 at the planned industrial zone in the southeast corner of Zhumadian City, Henan Province, China.

The geographic coordinate of the project site is situated as:

North-west corner: East longitude 114°03'39" North latitude 32°57'31"

South-west corner: East longitude 114°03'39" North latitude 32°57'22"

South-east corner: East longitude 114°03'52" North latitude 32°57'22"

North-east corner: East longitude 114°03'52" North latitude 32°57'31"

The geographic coordinate of the mark points within the project site are situated as

1 # Cooling tower: East longitude 114° 03' 41" North latitude 32° 57' 24"

2 # Cooling tower: East longitude 114° 03' 46" North latitude 32° 57' 24"

1 # Boiler stack: East longitude 114° 03' 48" North latitude 32° 57' 27"

2 # Boiler stack: East longitude 114° 03' 48" North latitude 32° 57' 29"

A.4. Technical description of the project

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The NGCC technology adopted in the proposed project consists of two phases of combined dynamic cycles: the first phase takes place in the gas turbine where the high temperature gas with about 1400°C generated by the natural gas combustion can power to rotate a coupled AC power generator to generate electricity - this is the Gas Cycle. In the second phase, the exhausted gas discharged from the gas turbine with about 600°C can generate steam with 540°C temperature and 10.67MPa pressure in a heat recovery boiler, which then expands in the followed up steam turbine to generate electric power in the AC power generator again - this is the Steam Cycle. Two phases of the cycles is combined to generate electricity with quite high efficiency. The NGCC Power Technology is one of the advanced clean and efficient power technology in the world, whose multiple advantages can be summarised as following:

- ◆Much high efficiency over conventional coal fired steam power generator units. The conversion efficiency of the state-of-art NGCC units could reach 58%.
- ◆Requirements for less land and water resources than coal fired power plant.
- ◆Fast start up and stop off with good flexibility of operation. It can improve the operation performance of the power grid and enhance the flexibility of the peak load dispatching.
- ◆Higher operation reliability with 85%-95% availability factor. It can improve the safety of the power grid.
- ◆Better environmental performance. The emission of the natural gas combustion is very little; whose CO₂ emission factor is less than about half of the coal.

China has not yet held design and manufacture technology for NGCC equipment over 350MW grade, which needs import from abroad through international bidding. By competitive bidding, Shanghai Electrical Group-German Siemens Company consortium won the tender of the project, so that by using the advanced Siemens technology, the whole set of the F9 grade gas turbine, steam turbine and generator equipment package are manufactured jointly by the Company consortium in Shanghai and German Siemens respectively, and the waste heat recovery boiler is made in China. These equipments are technologically matured and advanced and can keep the advanced level in the Country for a long period in the future. According to the China's principle, i.e. "combination of technology transfer with equipment trade", and "exchange of equipment market for technology", the import of the manufacture technology for the main gas turbine equipment and the NGCC power station design



technology constituted as an integrated part of the whole bidding contract. Therefore the proposed project fully meets the eligibility requirement of CDM for promoting technology transfer.

The electricity generated is delivered to the Central China Power Grid through 500 kV transmission line.

The natural gas consumed as fuel in this project come from “West-to-East natural gas transmission Pipeline” (via Southern Henan branch pipeline). The project owner has already invested in the branch pipeline construction. Furthermore, the long-term natural gas supply contract has been signed with the natural gas pipeline company, to guarantee the reliability and stability of the natural gas supply.

The technical performance indicators of the advanced technologies employed in the project are listed the table below (data source: the Feasibility Study Report of the project).

No.	Indicator Description	Units	Data
1.0	Gross output power at full load under ISO conditions	MW	2×402.5
2.0	Gross thermal efficiency at full load	kJ/kWh	6170
3.0	Gas Turbine		
3.1	Manufacturer and Country of origin	Siemens Co. in Germany	
3.2	Type	TCFI	
3.3	Rated speed	rpm	3000
3.4	Flow rate of flue gas at the gas turbine	t/h	2396.5
3.5	Temperature of flue gas at the gas turbine	°C	586.5
3.6	Gas turbine output	MW	243.4
4.0	Steam Turbine		
4.1	Manufacturer and Country of origin	Shanghai Steam Turbine Co.,Ltd	
4.2	Type	TCFI	
4.3	Rated Speed	rpm	3000
4.4	Performance data under design conditions		
4.5	Steam turbine output	MW	133.8
4.4.1	A) Steam Pressure (MPa.a)		
	HP: 12.185, IP: 2.903, LP: 0.33		
4.4.2	B) Steam Temperature (°C)		
	HP: 564.4, IP: 549.4, LP: 237		
4.4.3	C) Main Steam Flow Rate (t/h)		
	HP: 260.104, IP: 308.19, LP: 43.132		
4.4.4	D) Exhaust Pressure	kPa.a	5.89/4.96
5.0	HRSG in Combined Cycle		
5.1	Manufacturer and Country of origin	Wuhan Boiler Manufacture Co.	
5.2	Feed water temperature of HRSG	°C	55
5.3	Output of generator	MVA	478
6.0	Generator		
6.1	Manufacturer and country of origin	Shanghai Elec. Group Co.	
6.2	Rated voltage	KV	21
6.3	Rated current	A	13142
6.4	Power factor		0.85
6.5	Number of phases		3
6.6	Rated frequency	Hz	50



6.7	Rated speed	rpm	3000
6.8	Total output for one set	MW	377.2

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

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Methodologies applied:

- ✓ The approved baseline and monitoring methodology AM0029 “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas” Version 03

Tools referred:

- ✓ Tool for the Demonstration and Assessment of Additionality - version 05
- ✓ “Tool to Calculate the Emission Factor for an Electricity System”, Version 01

Available at: <http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

A.6. Registration date of the project activity:

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The project was registered as a CDM project in August 25th 2009.

More information can be found on the website:

<http://cdm.unfccc.int/Projects/DB/TUEV-SUED1229357612.62/view>

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

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Crediting period

Date	ERs (tCO ₂ e)
Jun 4 th 2007	Started operation
Aug 25 th 2007	Crediting period start
Aug 25 th 2007 to Dec 31 st 2007	13,398
Jan 1 st 2008 to Jan 9 th 2009	267,832
Jan 9 th 2009 to Aug 24 th 2009	278,338
Aug 25 th 2009	CDM project registration
Total	559,568

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

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Mr. Tang Bin
Project Manager
Carbon Asset Development
First Climate (Beijing) Ltd.
92 Jianguo Avenue, Chaoyang District | 100022 Beijing | P.R. China
E-Mail: Tang.bin@firstclimate.com

**SECTION B. Implementation of the project activity****B.1. Implementation status of the project activity**

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The project started operation in June 4th 2007, and finally registered as a CDM project in August 25th 2009. Thus this crediting period is from June 4th 2007 to August 24th 2009.

The project is implemented according to designed PDD, there is no changing to the plan.

B.2. Revision of the monitoring plan

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The monitoring plan was not revised.

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

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There is no deviation applied to this monitoring period.

B.4. Notification or request of approval of changes

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There is no notification or request of approval of changes to this project.

SECTION C. Description of the monitoring system

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C.1 The user of the monitoring report

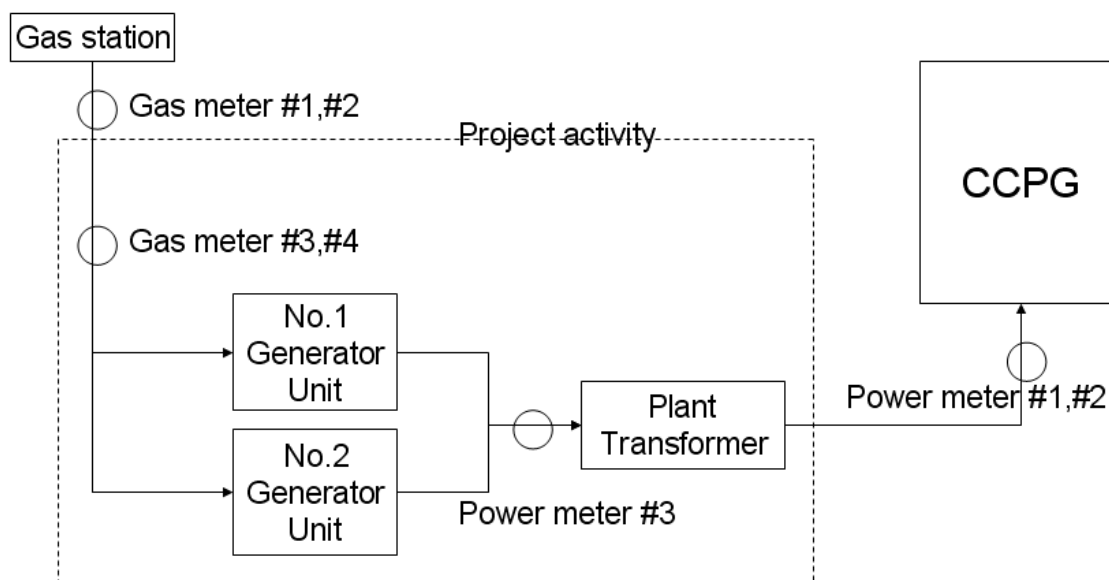
This monitoring report has been implemented by the project owner, Henan Zhongyuan Gas Power Company Ltd

Activities and performance related to emission in the plant has been monitored inline with monitoring plan in PDD and methodology.

C.2. Metering system

The main content of metering:

- Electricity delivered to the grid
- Quantity of the natural gas consumed
- NCV of the natural gas
- The baseline CCPG grid emission factors EF_{BM}



Monitoring equipment and instrument for electricity supplied

Two bidirectional meters No.1 and No.2 with accuracy of 0.2S (gateway meters) are installed on the Grid side of the 500KV Chaya main substation for continuously and automatically measuring the export-grid supplied and the import-grid electricity by proposed project. No.1 and No.2 meter is the backup of each other.

The meter No.3 with accuracy of 0.2S installed on Low voltage side of the 110KV/6KV transformer at project site is used for measuring the import-grid electricity purchased in case the electricity is needed for starting up the power units. Therefore the total net electricity delivered to the grid is calculated by deducting the import-electricity from the export-electricity delivered to the grid.

Monitoring equipment and instrument for natural gas consumed

The main gas metering point is installed at the gas station of NG supplier in front of the natural gas delivery point, where two gas flow meters are installed (#1 and #2 meter) with accuracy of 1.0. Meanwhile, behind the natural gas delivery point, two cross-check gas flow meters (#3 and #4 meter) with accuracy of 0.5 are installed at project activity before the gas inlet for unit # 1 and # 2. These 4 meters are used for gas consumption monitoring (both supply side and demand side) according to Methodology AM0029.

Natural gas NCV analysis devices

For the measurement of natural gas flowing at the point of measurement, the gas composition analysis is carried out by one set of on-line gas chromatography analyzer by acquiring the gas sample from the continuous operated sampling line which is linked with the gas flow.

C.3 Data collection

Data collection on electricity export and import.



- 1) The representatives from the project owner and the grid company reads the gateway primary meter No.1 regularly and the data has been recorded for monitoring, verifying, billing and cross checking;
- 2) The project owner also recorded the net amount of electricity delivered to the grid from gateway backup meter No.2.

In case the reading data difference between the primary and the backup gateway meters is beyond the allowance range or the meter is found to be malfunction, the amount of electricity supplied to the grid was determined by the following methods defined in approved PDD:

- 1) Firstly, the third-party arbitration agency designated by the grid company and the owners will read the data from the check meters which are installed at the output of both #1 and #2 generation units, and calculate the amount of electricity supplied to the grid based on the historical line losses rate, unless the agency identifies that the check meter is inaccurate;
- 2) In case the check meter's accuracy is not acceptable by standard or its operation does not meet the required standard, an appropriate and conservative method for estimation of the electricity supplied to the grid was designed jointly by the project owner and the power plant, and justify the reasonableness and the conservativeness of the alternative method to verifying DOE by providing sufficient evidence.
- 3) If no agreement on the estimate method is reached between the project owners and the grid company, the arbitration procedures should be applied to determine the consistency of the estimate method.

During the monitoring period of (June 4th 2007 to August 24th 2009), no abnormal difference has been found regarding calculation of emission reduction.

The data collection on amount of natural gas consumed and the NCV analysis results

According to “the Measurement Law of PRC”, natural gas is measured by volume under the standard condition of 20°C (293.15K) and absolute pressure 101.325KPa (one standard atmospheric pressure). The gas supplier and the project owner verify the amount of natural gas supplied and consumed based on the reading from the measuring equipment currently installed at the Zhumadian gas supply terminal, which are approved by both sides. The natural gas consumption was recorded daily, which is cross checked with purchase invoices. The project owner has preserve all relevant documents and records on the natural gas measurement.

The data collection for calculation of grid baseline emissions factor

The data for calculating grid baseline emissions factors of the crediting years are taken from the latest sources available of the crediting year from the official website of the China's DNA, i.e. NDRC.

The principal of the CDM group of the project company is required to provide the latest annual data available to the verifying DOE to assist the verification and certification for the ex-post calculating the baseline emission factors.

C.4 Management operation

The CDM Leading Group that has been set up internally by the Henan Zhongyuan Gas Power Plant, is dedicated to be in charge of implementation and management of the whole monitoring plan. The CDM



leading group director and all members were trained and supported by the CDM project advisor & consultant entity technically. The General Manager of the Company authorized CDM working team leader to manage and supervise over the CDM Leading Group.

C.5 Quality assurance and quality control measures

Main Roles and responsibilities:

Mr. Huangjian, The Director of the proposed project exercised oversight on behalf of the Chairman. The nominated CDM responsible person is Mr. Chen Zhiqiang who is responsible for monitoring plan implementation.

Internal audits and control measures:

All electricity meters installed has been calibrated by authorized organization – Technical center of central China power grid company once per year in accordance with manufacturer's recommendations and National Regulations (Verification Regulation of Electrical Energy Meters with Electronics JJG596-1999) for ensuring reliability of the system. Calibrations have been evidenced with certificates of calibration for the relevant meter(s) issued by a authorized organization.

The project owners signed agreement with authorized and qualified institution for calibration and testing on the precision of the gas metering devices, in order to ensure the monitoring accuracy on the natural gas consumption. The calibration and testing for the natural gas metering devices was conducted periodically according to the national measurement standard and regulation.

The calibration and testing for on-line gas chromatography was carried out by the qualified measurement technology verification institution National Institute of Metrology P.R.China authorized by Chinese government in accordance with the China's national standards GB/T-13610.

Characteristics and Calibration of the meters

Meter	Data collected	Meter type	Calibration history	Valid Date	Accuracy	Serial Number	Manufacture
Gas meter #1	Gas supply from the station	TRZ IFS G4000	May 25 th 2007 Aug 15 th 2008 Nov 19 th 2009	Aug 24 th 2008 Aug 14 th 2009 Nov 18 th 2011	1.0	83034059	ELSTER
Gas meter #2	Gas supply from the station	TRZ IFS G4000	May 15 th 2007 Aug 15 th 2008 Dec 08 th 2009	Aug 14 th 2008 Aug 14 th 2009 Dec 7 th 2011	1.0	83034891	ELSTER
Gas meter #3	Gas consumption at the plant	SM-RI-X-L G4000	Feb 18 th 2007 Mar 6 th 2008 Mar 6 th 2009	Feb 17 th 2008 Mar 5 th 2009 Mar 5 th 2010	0.5	10501764-2005	INSTROME
Gas meter #4	Gas consumption at the plant	SM-RI-X-L G4000	Apr 20 th 2007 Aug 18 th 2008 Aug 22 nd 2009	Apr 19 th 2008 Aug 17 th 2009 Aug 21 st 2010	0.5	10501765-2005	INSTROME
Power meter #1	Power supplied to the Grid	WU.TE43 2S	Oct 13 th 2006	Oct 12 th 2011	0.2s	18450580	ISKRA
Power meter #2	Power supplied to the Grid	WU.TE43 2S	Oct 12 th 2006	Oct 11 th 2011	0.2s	18450567	ISKRA
Power	Power delivered	SL7000	Nov 14 th 2006	Nov 13 th 2010	0.2s	33049104	ACTARIS



meter #3	from the Grid						
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Troubleshooting procedures:

In case there are errors found in calibration or during the regular checks, the malfunctioning meter or component shall be repaired or replaced immediately in accordance with the manufacturers' instructions, and all data recorded since the last recorded successful check or calibration shall be declared void. Back up meters and data have been identified as alternative sources.

The CDM responsible person and specialists was informed of the error and ensured that the necessary corrective actions are taken to resolve the problem causing the error and appropriate steps would be taken and to re-calibrate the malfunctioning meter. The error shall be recorded in an error log giving date and time of error discovery, nature of error and corrective action taken.

During this monitoring period, no errors have been found regarding calculation of emission reduction.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors	
<i>(Copy this table for each data and parameter. To report multiple values, a table may be used)</i>	
Data / Parameter:	GWP_{CH4}
Data unit:	t CO ₂ e/t CH ₄
Description:	Global Warming Potential for methane
Source of data used:	1995 IPCC GWP Value" proposed by the IPCC Second Assessment Report
Value(s) :	21
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for Leakage emission calculation
Additional comment:	

Data / Parameter:	EF_{Oil,upstream,CH4}
Data unit:	t CH ₄ /PJ
Description:	Emission Factor for upstream fugitive methane emissions of crude oil from production, transport, refining and storage processes.
Source of data used:	Revised IPCC 1996 Guidance default value, Tables 1-60 to 1-64, p. 1.129 - 1.131
Value(s) :	4.1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for Leakage emission calculation
Additional comment:	



Data / Parameter:	EF_{NG,upstream,CH4}
Data unit:	t CH4/PJ
Description:	Emission Factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system.
Source of data used:	Revised IPCC 1996 Guidance default value, Table 1-63 and 1-64, p.1.130 and p.1.131
Value(s) :	296
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for Leakage emission calculation
Additional comment:	

Data / Parameter:	EF_{Coal,upstream,CH4}
Data unit:	t CH4/kt coal or tCH4/MJ
Description:	Emission factor for upstream fugitive methane emissions from coal production
Source of data used:	Revised 1996 IPCC Guideline Vol.3, default value, as required by AM0029, version 03.
Value(s) :	13.4 t CH4/kt coal
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for Leakage emission calculation
Additional comment:	

Data / Parameter:	EF_{CO2,NG,v}
Data unit:	tC/TJ
Description:	tC/TJ
Source of data used:	Determined by National data which is cited from 2006 IPCC Guidelines for National Greenhouse Gas Inventories” Volume 2 Energy, Chapter I, Table 1.3 and Table1.4 in Page 1.21-1.24.
Value(s) :	15.30
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for project emission calculation
Additional comment:	

D.2. Data and parameters monitored*(Copy this table for each data and parameter. To report multiple values, a table may be used)*

Data / Parameter:	FC_{NG,v}
Data unit:	Nm ³
Description:	Annual quantity of natural gas consumed in project activity
Measured /Calculated	Measured



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/Default:	
Source of data:	NG flow meter reading at the project boundary.
Value(s) of monitored parameter:	690,134,822
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for project emission calculation.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Gas flow meter
Measuring/ Reading/ Recording frequency:	The NG flow rate was monitored continuously both by supplier and project owner. The monitoring data of the NG consumption was aggregated and recorded daily.
Calculation method (if applicable):	Meter Reading
QA/QC procedures applied:	The total NG consumption was monitored both at supplier and project side for cross-checking. Natural gas flow meters installed were subject to regular maintenance, calibration and testing to ensure accuracy and good operation condition (in accordance with stipulation of the meter supplier). The monitoring readings was double checked with the receipt by the gas supply company

Data / Parameter:	NCV_{NG,y}
Data unit:	MJ/Nm³
Description:	Net Calorific Value of NG
Measured /Calculated /Default:	Measured
Source of data:	Specific value on natural gas resource, published periodically by the Petro China Company Ltd. on its Website.
Value(s) of monitored parameter:	34.00
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for project emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	On-line Gas Chromatograph of Petro China Company.
Measuring/ Reading/ Recording frequency:	The readings were recorded daily.
Calculation method (if applicable):	-
QA/QC procedures applied:	The calibration and testing for on-line gas chromatography was carried



	out by the qualified measurement technology verification institution authorized by Chinese government.
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Data / Parameter:	$EG_{net\,pj,y}$ (Gateway meters No.1 and meter No.3)
Data unit:	MWh
Description:	The actual annual net electricity delivered by the project activity, measured by the meters No.1 and No.3 at the monitoring point.
Measured /Calculated /Default:	Measured
Source of data:	Reading at project boundary by electricity energy meter with bidirectional reading function, and the electricity purchase receipt from the power grid company.
Value(s) of monitored parameter:	3,367,494
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for Baseline emission calculation.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Electricity meters
Measuring/ Reading/ Recording frequency:	The electricity was measured by the electricity meter continuously and recorded daily and monthly.
Calculation method (if applicable):	-
QA/QC procedures applied:	The electricity output was monitored and recorded at the on-site computer control centre. The record of electricity delivered and the receipt of the electricity purchase was cross-checked by both the project owner and the power grid company. The electricity flow meters installed were subject to regular maintenance, calibration and testing to ensure accuracy and good operation condition (in accordance with national industrial standard).

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO₂e/MWh
Description:	Build marginal emission factor of the CCPG during the project operation period
Measured /Calculated /Default:	Default
Source of data:	China's DNA CDM official Website: http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3239 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2333.pdf
Value(s) of monitored parameter:	0.6687 (Year 2007) 0.5802 (Year 2008 and 2009)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for Baseline emission calculation.



Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures applied:	According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

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According registered PDD, Baseline emissions are given as:

$$BE_y = EG_{pj,y} \times EF_{BL,CO_2,y}$$

where:

$EG_{pj,y}$: Net amount of electricity generated by the project and sold into CCPG in this selected first monitoring period. The monitored data is list in Section D of this monitoring period.

$EF_{BL,CO_2,y}$: As mentioned in PDD,

$EF_{grid,BM,y}$ is selected as the baseline emission factor of CCPG because it is the conservative one of the 3 options according to AM0029.

Calculation of $EF_{BL,CO_2,y}$ of CCPG in this monitoring period.

The detailed steps and formulas of calculating baseline emission of CCPG are as follows:

Step a: calculate the proportion λ_i of the CO₂ emission of solid, liquid and gas fuel type consumed for power generation to the total CO₂ emission from the total thermal power generation.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$



$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

Where:

$F_{i,j,y}$: = the amount of fuel i (in unit t or Nm^3) consumed by relevant power sources in provincial grid j in year y ;

$COEF_{i,j,y}$: = the CO_2 emission coefficient of fuel i (tCO_2/t or Nm^3), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y ,

Calculation of $EF_{BL,CO_2,y}$ of CCPG in this monitoring period.

The detailed steps and formulas of calculating baseline emission of CCPG are as follows:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$$

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the emission factors of advanced coal-fired, oil-fired and gas-fired power generation technology, see detailed parameter and calculation in Chinese DNA published OM&BM of the crediting year.

Calculation of $EF_{BM,y}$ of CCPG in this monitoring period.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

Where:

CAP_{Total} is the total increased capacity,

$CAP_{Thermal}$ is the increased thermal power capacity

According to the parameter and calculation in Chinese DNA published BM in the crediting period is:

	2007	2008 and 2009
$EF_{BM,y}$	0.6687	0.5802

E.2. Project emissions calculation

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Project Emissions

According to section 6.1 of register PDD, Project Emissions are given as:

$$PE_y = FC_{NG,y} \times COEF_{NG,y}$$

Where

$FC_{NG,y}$: the total volume of NG combusted (Nm^3) during this monitoring period. The monitored data is list in Section D of this monitoring period.

$COEF_{NG,y}$: the CO_2 emission coefficient ($t CO_2/Nm^3$) during this monitoring period for NG, which is calculated as follows:



$$COEF_{NG,y} = NCV_{NG,y} \times EF_{CO2,NG,y} \times OXID_{NG}$$

Where:

$NCV_{NG,y}$: the net calorific value (energy content) per volume unit of NG during this monitoring period (GJ/m^3) as provided by the fuel supplier. The monitored data is list in Section D of this monitoring period.

$EF_{CO2,NG,y}$: the CO_2 emission factor per unit of heat value of NG in this monitoring period. It was determined by national data which is cited from updated edition of IPCC 2006, page24 according to register PDD. The $EF_{CO2,NG,y}$ is 15.3tC/TJ

$OXID_{NG}$: the oxidation rate of NG, the IPCC default value 100% is used according to registered PDD.

E.3. Leakage calculation

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As mentioned in PDD:

$$LE_y = LE_{CH4,y}$$

$$LE_{CH4,y} = [FC_y \times NCV_y \times EF_{NG,upstream,CH4} - EGG_{PJ,y} \times EFC_{BL,upstream,CH4}] \times 21$$

Where:

$LE_{CH4,y}$: Leakage emissions due to fugitive upstream CH_4 emissions in the year y in t CO_2e .

FC_y : Total volume of NG combusted (Nm^3) during this monitoring period.

$NCV_{NG,y}$: Net calorific value of NG (GJ/Nm^3), which is determined by the fuel supplier.

$EF_{NG,upstream,CH4}$: Emission factor for upstream fugitive methane emissions from production of gas in t CH_4/Nm^3 . Default value of 296 has been applied in PDD for area of China.

$EGG_{PJ,y}$: Electricity generation in the project plant during this monitoring period in MWh.

$EF_{BL,upstream,CH4}$: The emission factor determined in PDD for upstream fugitive methane emissions occurring in the absence of the project activity in t CH_4 /MWh. The value is 0.00453542t CO_2 /MWh before 2008 and 0.004246953 t CO_2 /MWh after 2008. The detail calculation process was included in ER calculation sheet.

E.4. Emission reductions calculation / table

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Total baseline emissions:

$$BE_y = EG_{pj,y} \times EF_{BL,CO2,y}$$

$$BE_y = 85,560 \times 0.6687 + 3,195,235 \times 0.5802 = 1,911,090tCO_2e$$

Total project emissions:

$$PE_y = FC_{NG,y} \times COEF_{NG,y} = 1,351,512tCO_2e$$

Total leakage:



$$LE_y = LE_{CH_4,y} = [FC_y \times NCV_y \times EF_{NG,upstream,CH_4} - EGG_{PJ,y} \times EFC_{BL,upstream,CH_4}] \times 21$$

$$LE_y = 9 \text{ tCO}_2\text{e}$$

Total emission reductions:

$$ER_y = BE_y - PE_y - LE_y = 1,911,090 - 1,351,512 - 9 = 559,569 \text{ tCO}_2\text{e}$$

Monitoring Result Table (Unit: tCO₂e)

Monitoring Period	BE	PE	LE	ER
2007.08.25-2007.09.07	2070.8	1762.5	0	308.3
2007.09.08-2007.09.17	0	0	0	0
2007.09.18-2007.09.21	6039.9	5862.2	0	177.7
2007.09.22-2007.10.05	768.8	9.5	0	759.3
2007.10.06-2007.10.19	7676.8	5397.3	0	2279.5
2007.10.20-2007.11.02	0	61.2	0.3	-61.5
2007.11.03-2007.11.16	18724.9	12810.2	0	5914.7
2007.11.17-2007.11.30	12754.7	8332.5	0	4422.2
2007.12.01-2007.12.14	0	61.4	0.3	-61.7
2007.12.15-2007.12.28	1509.1	3289.9	7.1	-1787.9
2007.12.29-2007.12.31	7669.3	6221.1	0	1448.2
Subtotal	57214.5	43808.0	7.8	13398.7
2008.01.01-2008.01.11	3811.9	3594.1	0	217.8
2008.01.12-2008.01.25	12127.2	14356.6	0	-2229.4
2008.01.26-2008.02.08	32185.4	20705.4	0	11480.0
2008.02.09-2008.02.22	24740.0	21727.7	0	3012.3
2008.02.23-2008.03.07	45826.5	32589.5	0	13237.0
2008.03.08-2008.03.21	55945.5	38089.3	0	17856.2
2008.03.22-2008.04.04	1303.7	2055.2	1.3	-752.8
2008.04.05-2008.04.18	58985.0	41089.4	0	17895.6
2008.04.19-2008.05.02	22170.9	15852.6	0	6318.3
2008.05.03-2008.05.16	37855.9	27750.2	0	10105.7
2008.05.17-2008.05.30	46947.5	34373.0	0	12574.5
2008.05.31-2008.06.13	49252.9	35557.6	0	13695.3
2008.06.14-2008.06.27	40322.3	28746.4	0	11575.9
2008.06.28-2008.07.11	29110.2	22004.6	0	7105.6
2008.07.12-2008.07.25	47519.7	32642.2	0	14877.5
2008.07.26-2008.08.08	40546.4	27312.9	0	13233.5
2008.08.09-2008.08.22	30738.5	24850.1	0	5888.4
2008.08.23-2008.09.05	35314.6	27463.9	0	7850.7
2008.09.06-2008.09.19	53701.4	37310.8	0	16390.6
2008.09.20-2008.10.03	32008.8	23228.1	0	8780.7
2008.10.04-2008.10.17	58316.2	42746.8	0	15569.4
2008.10.18-2008.10.31	81833.9	57257.6	0	24576.3
2008.11.01-2008.11.14	33467.4	22071.1	0	11396.3
2008.11.15-2008.11.28	21024.3	16236.7	0	4787.6



2008.11.29-2008.12.12	28255.1	19664.7	0	8590.4
2008.12.13-2008.12.26	14955.2	8899.6	0	6055.6
2008.12.27-2009.01.09	24670.8	16927.4	0	7743.4
Subtotal	962937.3	695103.8	1.3	267832.2
2009.01.10-2009.01.23	24279.2	15109.6	0	9169.6
2009.01.24-2009.02.06	55516.9	39830.8	0	15686.1
2009.02.07-2009.02.20	55336.3	41047.9	0	14288.4
2009.02.21-2009.03.06	46926.5	32576.6	0	14349.9
2009.03.07-2009.03.20	62350.5	43680.5	0	18670.0
2009.03.21-2009.04.03	67352.9	46547.1	0	20805.8
2009.04.04-2009.04.17	54818.0	38054.9	0	16763.1
2009.04.18-2009.05.01	49954.3	35287.2	0	14667.1
2009.05.02-2009.05.15	66768.5	46401.0	0	20367.5
2009.05.16-2009.05.29	62899.2	42912.3	0	19986.9
2009.05.30-2009.06.12	51331.6	35159.8	0	16171.8
2009.06.13-2009.06.26	71357.2	46902.5	0	24454.7
2009.06.27-2009.07.10	57069.9	38845.6	0	18224.3
2009.07.11-2009.07.24	53832.4	35847.6	0	17984.8
2009.07.25-2009.08.07	57992.9	37629.2	0	20363.7
2009.08.08-2009.08.21	44404.4	30631.8	0	13772.6
2009.08.22-2009.08.24	8747.4	6135.7	0	2611.7
Subtotal	890938.3	612600.1	0	278338.2
Total	1911090	1351512	9	559568

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	Actual values reached during the monitoring period
Emission reductions (tCO₂e)	Estimated 858,165 t CO₂e annual (means 2,351 t CO₂/day)	
Aug 25 th 2007 to Dec 31 st 2007	Estimated 303,279 t CO₂e (129 days)	13,398 t CO₂e
Jan 1 st 2008 to Jan 9 th 2009	Estimated 879,274 t CO₂e (374days)	267,832 t CO₂e
Jan 9 th 2009 to Aug 24 th 2009	Estimated 533,677 t CO₂e (227 days)	278,338 t CO₂e
Total	Estimated 1,716,230 t CO₂e	559, 568 t CO₂e (PLF 32.6%)

According to the comparison above, it is clearly showed that the actually project activity did not occur any increase in Emission Reductions in the crediting period. The **Project Load Factor** is 32.6% of estimate value. There is no over performance of the project.

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

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The actual value of emission reduction during the monitoring period is lower than estimated in the PDD. There is no increase occurred.

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		