

**MONITORING REPORT FORM (F-CDM-MR)**
Version 02.0**MONITORING REPORT**

Title of the project activity	Nanjing Jinling Grid Connected Natural Gas Combined Cycle Power Plant Project
Reference number of the project activity	3008
Version number of the monitoring report	2.0
Completion date of the monitoring report	26/11/2012
Registration date of the project activity	05/08/2010
Monitoring period number and duration of this monitoring period	The Fourth Monitoring Period: 01/01/2011 – 31/03/2011
Project participant(s)	• Huaneng Nanjing Jinling Power Generation Co., Ltd • Gaisi Peony Carbon Capital s.a.r.l
Host Party(ies)	People's Republic of China
Sectoral scope(s) and applied methodology(ies)	Sectoral scope 1: Energy industries (renewable - / non-renewable sources) Applied methodologies: AM0029 (Version 3)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	257,506 tCO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	106,575 tCO ₂ e

**SECTION A. Description of project activity****A.1. Purpose and general description of project activity**

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Nanjing Jinling Grid Connected Natural Gas Combined Cycle Power Plant Project (hereafter referred to as the “Project”) is a grid-connected natural gas combined cycle electricity generation plant, constructed, owned and operated by Huaneng Nanjing Jinling Power Generation Co. Ltd (hereinafter called “the Project Owner”) in Jiangsu Province, China. The project has a total installed capacity of 780MW, and will supply approximately 2,716,000 MWh of electricity per annum to East China Power Grid (ECPG).

The purpose of the project activity is to displace an equal amount of electricity generated by coal-fired thermal power plants which would have been built otherwise, by applying a less GHG intensive fuel (natural gas), and consequently achieve greenhouse gas (GHG) emission reductions.

The project applies GE technology (unit code GE-109FA), composed of two sets of 390MW gas-steam combined cycle generation system.

Relevant dates for the Project Activity are listed in the table below.

Table A1. Relevant dates for the Project Activity

Dates (dd/mm/yyyy)	Project Implementation
28/03/2006	Civil construction completed
31/12/2006	First 390 MW unit put into operation
05/03/2007	Second 390 MW unit put into operation
05/08/2010	CDM registration
05/08/2010~31/08/2010	1 st monitoring period
01/09/2010~30/11/2010	2 nd monitoring period
01/12/2010~31/12/2010	3 rd monitoring period
01/01/2011~31/03/2011	4 th monitoring period (this monitoring period)

The current monitoring period is the fourth monitoring period of the Project that covers 01/01/2011 - 31/03/2011 a total of 90 days.

In this monitoring period, the Project achieved total emission reductions of 106,575 tCO₂e.

A.2. Location of project activity

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The Project is located at Longtan County, Qixia district of Nanjing City within Jiangsu Province, P.R. China, the geographical coordinates are 119°00'45" east longitude and 32°10'17" north latitude.

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China	Huaneng Nanjing Jinling Power Generation Co., Ltd	No
United Kingdom of Great Britain and Northern Ireland	Gaisi Peony Carbon Capital s.a.r.l	No

A.4. Reference of applied methodology

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Version 03 of Approved baseline methodology AM0029: "Baseline Methodology for Grid Connected Electricity Generation project using Natural Gas" and "Monitoring methodology for grid connected generation plants using non-renewable and less GHG intensive fuel" (Version 03, 16/05/2008).

References:

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

A.5. Crediting period of project activity

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7*3 years renewable crediting period is adopted for the Project Activity. The first crediting period is from 05/08/2010 to 04/08/2017.

SECTION B. Implementation of project activity**B.1. Description of implemented registered project activity**

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Technical description of the project

The Natural Gas Combined Cycle (NGCC) technology (unit code GE-109FA) applied by the Project is supplied by the US manufacturer General Electric. The project consists of two sets of 390MW gas-steam combined cycle generation system. Each set contains one gas turbine, one steam turbine, one generator and one heat recovery steam generator (HRSG). The gas and steam turbines are coupled to the generator in a tandem arrangement on a single shaft. The main performance data of the combined cycle unit is given in the table below:

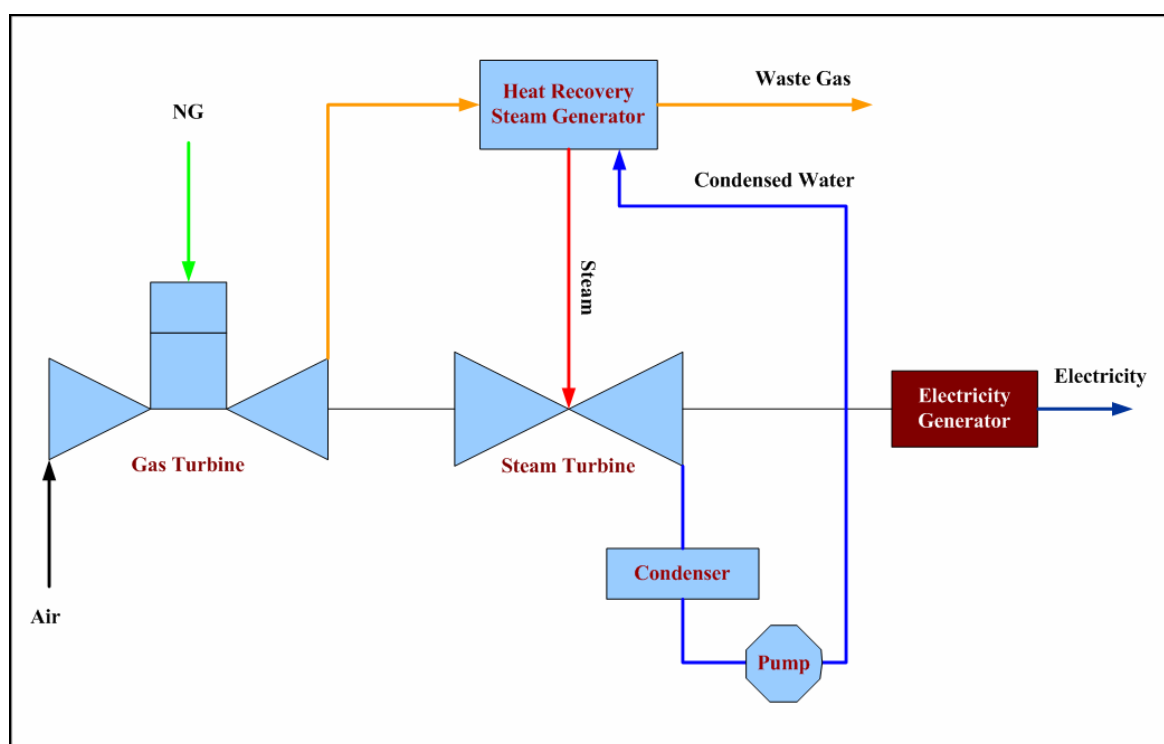
Equipment	Specifications	Manufacturer
Gas turbine	Model: PG-9351FA Capacity: 255.6MW; Firing temperature: 1326.7°C Rotational speed: 3000r/min	GE-Harbin Power Equipment Company
Heat Recovery Steam Generator (HRSG)	High pressure steam volume: 286.1 t/h Reheated steam volume: 314.2 t/h Low pressure steam volume: 42.7 t/h	NEM-Wuhan Boiler Works
Steam turbine	Model: D10 Capacity: 141MW; Rotational speed: 3000r/min	GE-Harbin Power Equipment Company
Electricity Generator	Model: 390H Capacity: 397.8MW Rated pressure: 19000V	GE-Harbin Power Equipment Company

	Power factor: 0.85	
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The combustor is fired with natural gas and produces hot, high pressure, low NO_x gases, which expand in the gas turbine. The gas turbine drives the generator at one end, and an axial compressor at the other end, which supplies compressed ambient air to the combustor. The thermal energy contained in the high temperature exit gases of the gas turbine is recovered in the HRSG, which is designed to maximize the heat recovery of gases and allows a minimum stack temperature of the exhaust gases. The steam generated from the HRSG is introduced to and expand in the steam turbine to drive the generator.

The process flow diagram of the Project is shown below, in Figure A1:

Figure A1: Process Flow Diagram of the Project



The project supplies electricity via two 220kv transmission lines to the 500kv Longwangshan¹ substation linking to the Jiangsu Grid, a sub-grid of ECPG from its operation day till 26/01/2011. From 27/01/2011 onwards, the connected substation of the Project was changed to 220kv Xidu Substation, which is also linked to Jiangsu Grid, according to the arrangement of the Jiangsu Grid Company.

Implementation status of the project activity

The first gas turbine unit started operations in December 2006 and the second unit started operations in March 2007.

The project was implemented as described in the revised PDD version 06.5 dated 26/11/2012. During this monitoring period, the project had a smooth operation and the monitoring system worked properly, no special events occurred.

¹ The use of the name “Longtan Substation” in the registered PDD was a typing mistake, which was verified by the DOE through on-site check in the first periodic monitoring period.

From 27/01/2011 onwards, the Project supplied electricity via two 220kv transmission lines to 220kv Xidu Substation, instead of the 500kv Longwangshan Substation previously, according to the arrangement of the Jiangsu Grid Company. 220kv Xidu Substation is also linked to the Jiangsu Grid, a sub-grid of the ECPG. Hence, the change in connected substation would not impact the applicability of the methodology, the project scale or additionality.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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Not applicable.

B.2.2. Corrections

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Not applicable.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

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Not applicable.

B.2.4. Changes to project design of registered project activity

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It is stated in the registered PDD version 06.4 dated 21/04/2010 that the project supplies electricity via two 220kv transmission lines to the 500kv Longtan Substation.

The use of the name “Longtan Substation” in the registered PDD is a typing mistake, which was verified by DOE through on-site check in the first periodic monitoring period (05/08/2010 - 31/08/2010). The correct name, which should have been used instead, is Longwangshan Substation, to which the Project has been connected since its operation (see the Verification and Certification Report for the first monitoring period for details²).

According to the arrangement of the Jiangsu Grid Company³, the connected substation of the Project was changed from 550kv Longwangshan Substation to 220kv Xidu Substation from 27/01/2011 onwards. 220kv Xidu Substation is also linked to the Jiangsu Grid, a sub-grid of the ECPG.

As the 220kv Xidu Substation is still within ECPG, and there is no change in the project boundary which would affect the baseline emission factor, there is no impact on the estimated emission reductions which may adversely impact additionality. The project capacity and applied technology are the same as the registered PDD.

As per CLEAN DEVELOPMENT MECHANISM PROJECT STANDARD, the aforementioned substation change is the **Changes to the project design of a registered CDM project activity** that do not raise any concerns with regard to i) additionality, ii) the scale of the CDM project activity and/or iii) the applicability and application of AM0029 (version 3), and therefore do not require prior approval by the Board.

The substation changes has been reflected in the revised PDD (version 06.5 dated 26/11/2012)

²

<http://cdm.unfccc.int/filestorage/Q/M/2/QM2G0ASOXJ5E1P9CDHL7UYZ48T6NI3/SGS%20Report%20CDM.VER1127%20MP1%2019.01.2011?t=Mmt8bWUzNmJkfDAjxsOxq5Z0Ypdrii3Kr1N>

³ “Jiangsu Power Dispatching Communication Centre Document” (No.Diandiao[2010]294)

“Jiangsu Power Dispatching Control Centre Document” dated 27/04/2011

B.2.5. Changes to start date of crediting period

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Not applicable.

B.2.6. Types of changes specific to afforestation or reforestation project activity

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Not applicable.

SECTION C. Description of monitoring system

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C.1 The equipment for monitoring and the installation of Meters**C.1.1 Monitoring of the net electricity generated by the Project and sold into the Grid (ECPG)**

The Project supplies electricity via two 220kv transmission lines to the 500kv Longwangshan substation linked to the Jiangsu Grid, a sub-grid of ECPG, from its operation day till 26/01/2011. From 27/01/2011 onwards, the connected substation of the Project was changed to 220kv Xidu Substation, which is also linked to Jiangsu Grid, according to the arrangement of the Jiangsu Grid Company. The Metering Points for electricity sold to ECPG ($EG_{out,y}$) are set at the project side of each transmission line, as shown in the Figure C.1. A main meter and a backup meter are installed at each Metering Point, including M1 and BM1 (backup meter to M1) for the first line, and M2 and BM2 (backup meter to M2) for the second line.

The four meters⁴ mentioned above are bi-directional meters which can measure electricity sold to and imported from the ECPG.

Serving as a peak-load balancing power plant, the Project is in standby mode at certain points of time during the course of operation. An additional meter M3 and its backup meter BM3 is installed at the project side to measure the electricity imported from the grid ($EG_{in,y}$) whilst it in idle status (please see the Figure C.1 for details). M3 and BM3 are one directional meters measuring only electricity imported from the grid.

The readings of the main meters (M1-M3) are taken for billing between the Project Owner and Grid Company, as well as for CDM purposes, while the readings of the backup meters (BM1-BM3) only serve for emergency situations.

The meter readings are readily accessible for the DOE. Calibration records are also be maintained for verification.

The net amount of electricity supplied to the Grid equals to ($EG_{out,y} - EG_{in,y}$).

The online meter readings of $EG_{out,y}$ and $EG_{in,y}$ are transferred to the computerized control center directly. Hourly readings are also manually recorded each day to give a daily output, and aggregated each month to give a monthly total.

Commercial invoices of each month can be used for cross checking.

C.1.2 Monitoring of quantity of NG combusted

The amount of natural gas combusted in Nm^3 is monitored both at the NG supplier and project end through flow meters and meter readings are recorded automatically. The two meters at the NG supplier side (GM1 and GM2) are taken for billing purpose between NG supplier and the Project Owner, as well as for CDM purpose. In addition, two flow meters (GM3 and GM4) are installed respectively before the gas inlet for Unit 1 and Unit 2 at the project side for internal cross-checking (See the Figure C.1 for details).

⁴ “Ammeters” was a typing mistake made in the registered PDD, which factually refers to “Electricity meters”.

The natural gas flow rate is monitored continuously both by the supplier and the Project Owner. The natural gas consumption is aggregated automatically and recorded daily.

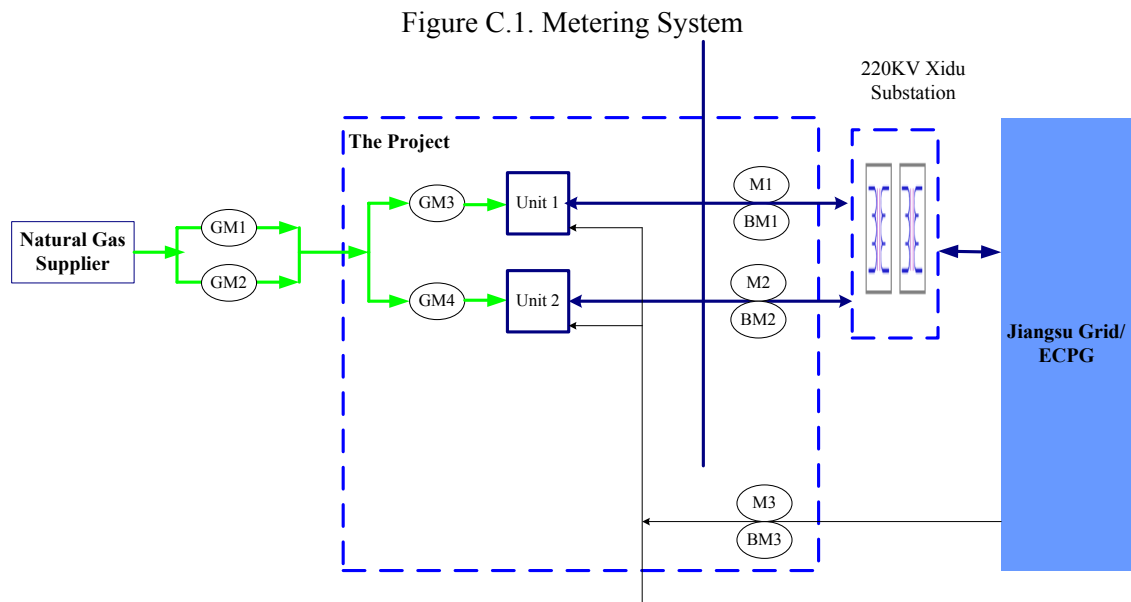
The meters' readings are also readily accessible for the DOE. Calibration records are maintained for verification.

The commercial receipts for the gas purchased by the Project Owner are kept and are readily accessible for verification by the DOE

C.1.3 Monitoring of NCV

NCV of the natural gas is obtained from the fuel supplier's NG test reports.

The line diagram showing all relevant monitoring points is as follows:



C.1.4 Data management

A CDM working team assigned by the project owner is responsible to collect, record and document all the related monitoring records.

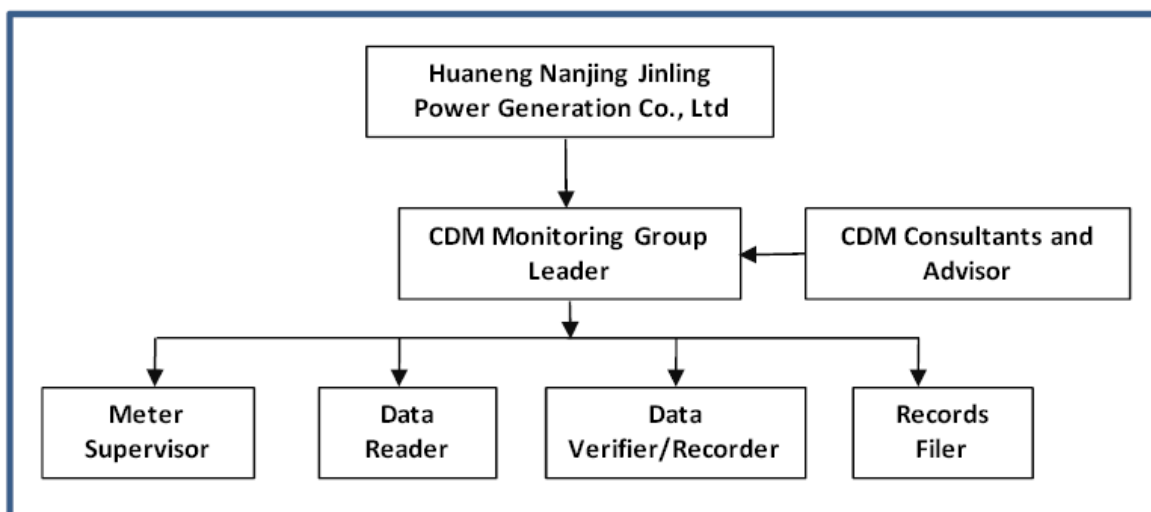
Any other physical documentation such as paper-based maps, diagrams and environmental assessments are collected, together with this monitoring plan, and indexed for the auditor's reference.

All relevant paper-based information is stored by the CDM working team and kept, at least with one hard copy, for two more years after the end of the crediting period for the Project.

C.2. Operational and Organizational Structure of Monitoring

The Project Owner is responsible for the work related to the monitoring, including the relevant data collection, documentation, monitoring and verification. A CDM working group has been established internally. The operational and organizational structure for the monitoring process is shown in Figure C2.

Figure C2: Operational and Organizational Structure of Monitoring



Responsibilities are shared between the PO and the CDM consultant as follows:

Roles	Responsibility
CDM Monitoring Group Leader	- Overall management of CDM monitoring group - Supervision of the implementation of the monitoring plan
Meter Supervisor	Meters registration, maintenance for meters, regular calibration of meters
Data Reader	Record and aggregate the readings related to electricity, natural gas, NCV according to specified frequency
Data Verifier/Recorder	Verification of monitoring data related to electricity, natural gas, NCV, etc.
Records Filer	Collection, compilation, and archiving the monitoring data
CDM Consultants and Advisor	CDM monitoring advice. Calculation of the baseline emission factors and emission reductions

The CDM group is responsible for finalising the monitoring report of the Project. All the related records of calibration, reading and invoices are readily accessible for the verification of the DOE.

Calibration

All the metering equipments are properly calibrated for accuracy in compliance with relevant industrial standards in China. Calibration details can be found in section D.2.

C. 3 Emergency procedures for the monitoring system

For electricity monitoring, if the Main Meters become in-operable for any reason then the electricity supplied and imported can still be calculated as follows:-

- (1) First, by reading the Backup Meter, unless a test by either party reveals it is inaccurate;
- (2) if the backup system is not within the acceptable limits of accuracy or is otherwise performing improperly the Project Owner and the Jiangsu Grid Company/ECPG shall jointly prepare an estimate of the correct readings; and

(3) If the Project Owner and the Jiangsu Grid Company/ECPG fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/Parameter	$EF_{NG, upstream, y}$
Unit	tCH ₄ /GJ
Description	Emission factor for upstream fugitive methane emissions of natural gas
Source of data	Methodology
Value(s) applied	0.000296
Purpose of data	Leakage emission calculation
Additional comment	-

Data/Parameter	$OXID_f$
Unit	-
Description	The oxidation factor of natural gas
Source of data	IPCC
Value(s) applied	100%
Purpose of data	Project emission calculation
Additional comment	-

Data/Parameter	GWP_{CH_4}
Unit	t CO ₂ e/CH ₄
Description	Global warming potential of methane
Source of data	IPCC
Value(s) applied	21
Purpose of data	Leakage calculation
Additional comment	-

D.2. Data and parameters monitored



Data/Parameter	$EG_{PJ,y}$							
Unit	MWh							
Description	Electricity supplied to the grid by the project activity							
Measured/Calculated /Default	Measured and calculated							
Source of data	Reading of the electricity meters and cross checked by the commercial invoices							
Value(s) of monitored parameter	350,237.8							
Monitoring equipment	Type	Meters	Serial number	Calibration Date	Validity	Accuracy	Calibration Frequency	
	Electricity meter	M1	96347828	27/10/2010	26/01/2011	0.2S	Once every three months	
				29/01/2011*	28/04/2011			
		BM1	96348248	27/10/2010	26/01/2011	0.2S	Once every three months	
				29/01/2011*	28/04/2011			
		M2	96348243	27/10/2010	26/01/2011	0.2S	Once every three months	
				29/01/2011*	28/04/2011			
		BM2	96348247	27/10/2010	26/01/2011	0.2S	Once every three months	
				29/01/2011*	28/04/2011			
		M3	96348211	27/10/2010	26/01/2011	0.2S	Once every three months	
				29/01/2011*	28/04/2011			
		BM3	96347836	27/10/2010	26/01/2011	0.2S	Once every three months	
				29/01/2011*	28/04/2011			
		M1-M3: Main meters BM1-BM3: Backup meters						
		*Note: the power plant was shut-down on 10-28 January 2011.						
		All meters above are calibrated by Jiangsu Electric Power Research Institute Corporation Limited in accordance with Technical Norm of the Calibration of AC Watt-hour Meters at Place of Installation (JJG 1055-1997).						
Measuring/Reading/Recording frequency	The meter readings are continuously measured hourly and recorded monthly.							
Calculation method (if applicable)	The amount of electricity supplied to the Grid is calculated as the difference between electricity sold to ECPG ($EG_{out,y}$) measured by M1 and M2 and electricity imported from the grid ($EG_{in,y}$) measured by M1-M3.							
QA/QC procedures	Electricity supplied by the project activity to the grid is monitored and recorded at the control center using a computer system. Commercial receipts for electricity are also kept for cross checking. All meters are calibrated every three month by a qualified third party. Data record and relevant documents will be archived for a period of 2 years after the crediting period							
Purpose of data	Baseline emission calculation and leakage emission calculation							
Additional comment	-							



Data/Parameter	$EF_{Grid,BM,y}$
Unit	tCO ₂ /MWh
Description	Build margin emission factor of ECPG
Measured/Calculated/Default	Calculated
Source of data	Calculated based on public available data (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf , published on 15/10/2012) as per provisions given in the “Tool to calculate emission factor for an electricity system” Version01.1
Value(s) of monitored parameter	0.6889
Monitoring equipment	N/A
Measuring/Reading/Recording frequency	As demonstrated in PDD Section B.6.1, the lowest value of the three options given in AM0029 Version03 is Option1-Build Margin of ECPG, it should therefore be monitored ex post as per AM0029 Ver03. According to the “Tool to calculate emission factor for an electricity system”, for the first crediting period, the build margin emission factor shall be updated annually, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available.
Calculation method (if applicable)	“Tool to calculate emission factor for an electricity system” Version01.1
QA/QC procedures	As per QA/QC procedures for relevant monitored parameters in the “Tool to calculate emission factor for an electricity system”
Purpose of data	Baseline emission calculation
Additional comment	-



Data/Parameter	FC _{f,y}						
Unit	Nm ³ (the computer system automatically converts the volume unit of natural gas into Nm ³)						
Description	Net amount of NG consumed by the project.						
Measured/Calculated /Default	Measured						
Source of data	Fuel flow meter readings						
Value(s) of monitored parameter	70,341,720						
Monitoring equipment	Type	Meters	Serial number	Date of last calibration	Validity	Accuracy	Calibration frequency
	NG flow meters at supplier side	GM1	03-110136	03/02/2010	02/02/2012	1.0	Once every two years
		GM2	03-110137	03/08/2010	02/08/2012	1.0	Once every two years
	NG flow meters at project side	GM3	0139943	30/07/2010	29/06/2011	0.25	Once per year
		GM4	0139940	30/07/2010	29/06/2011	0.25	Once per year
	- Meters at supplier side are ultrasonic flow meters, which have been calibrated by Nanjing Branch of National Station of Petroleum & Natural Gas Flow Measurement in accordance with the <i>Verification Regulation of Ultrasonic Flow Meter</i> (JJG1030-2007) - Meters at project side are orifice plate flow meters, which have been calibrated by the Metrology Central Laboratory of Jiangsu, SPC in accordance with the <i>Verification Regulation of the Pressure Transmitter</i> (JJG882-2004)						
Measuring/Reading/Recording frequency	The natural gas flow rate is monitored continuously by the supplier and the project owner. The natural gas consumption is aggregated automatically and recorded daily.						
Calculation method (if applicable)	Meter readings						
QA/QC procedures	The total amount of natural gas consumed by the Project is monitored both by supplier and the project owner for internal cross-checking. To be conservative, the larger of these two values is used to calculate the gas consumed by the Project. All meters used for the reading of the gas supplied have been retained for regular maintenance and testing services for an ensured accuracy. Their calibration frequencies are shown below: - Meters at supplier side (GM1 and GM2): once every two years; - Meters at project side (GM3 and GM4): once per year All electronic and paper documents will be archived during the crediting period and for two years after the end of the crediting period.						
Purpose of data	Project emission calculation						
Additional comment	-						

Data/Parameter	$NCV_{f,y}$
Unit	GJ/Nm ³ (GJ/Nm ³ is used in NG test reports provided by gas supplier)
Description	Net calorific value per volume unit of natural gas
Measured/Calculated/Default	Measured and calculated as weighted average value
Source of data	NG test reports issued by gas supplier
Value(s) of monitored parameter	0.034135
Monitoring equipment	N/A
Measuring/Reading/Recording frequency	Measured and recorded fortnightly as per AM0029 Version 3 and the revised PDD.
Calculation method (if applicable)	Weighted average value of fortnightly NCV values as per AM0029 Version 3 and the revised PDD.
QA/QC procedures	N/A
Purpose of data	Project emission calculation and leakage emission calculation
Additional comment	-

Data/Parameter	$EF_{CO_2,f,y}$
Unit	tCO ₂ /GJ
Description	Emission factor of natural gas
Measured/Calculated/Default	Default
Source of data	Conservative value between National data (0.0543 t CO ₂ /GJ) issued by Chinese DNA (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf) and the data (0.0561 t CO ₂ /GJ) in the revised PDD
Value(s) of monitored parameter	0.0561
Monitoring equipment	N/A
Measuring/Reading/Recording frequency	Annually
Calculation method (if applicable)	N/A
QA/QC procedures	N/A

D.3. Implementation of sampling plan

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Not applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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Baseline emissions are calculated by multiplying the electricity supplied to the ECPG ($EG_{PJ,y}$) with a baseline CO₂ emission factor ($EF_{BL,CO_2,y}$) as follows:

$$BE_y = EG_{PJ,y} \times EF_{BL,CO_2,y} \quad (1)$$

Where:

Parameter		Unit	Value
EG _{PJ,y}	Electricity supplied to the grid by the Project, which is calculated as electricity sold to the grid (EG _{out,y}) minus electricity imported from the grid (EG _{in,y}). See the table below for details.	MWh	350,237.8
EF _{BL, CO₂, y}	The baseline CO ₂ emission factor According to the revised PDD, Option 1, i.e EF _{grid,BM,y} is selected as the baseline emission factor of ECPG, which is ex-post calculated and updated. See the ERs spreadsheet for details.	tCO ₂ /MWh	0.6889

$$\text{So, } BE_y = EG_{PJ,y} \times EF_{grid,BM,y} \quad (2)$$

EG_{PJ,y} Determination:

No.	Period		EG _{out,y}	EG _{in,y}	EG _{PJ,y}
	From	To	(MWh)	(MWh)	(MWh)
A	B	C	D	E	F=D-E
1	01/01/2011	31/01/2011	26,129.840	1,470.414	24,659.426
2	01/02/2011	28/02/2011	132,433.400	1,357.598	131,075.802
3	01/03/2011	31/03/2011	195,441.840	939.268	194,502.572
Total					350,237.800

Note: Please see the ERs spreadsheet for more details.

Calculate the build margin (BM) emission factor (EF_{grid,BM,y}):

The build margin emissions factor is the generation-weighted average emission factor (tCO₂/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (3)$$

Where:

$EF_{grid,BM,y}$: Build margin CO₂ emission factor in year y (tCO₂/MWh);

$EG_{m,y}$: Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);

$EF_{EL,m,y}$: CO₂ emission factor of power unit m in year y (tCO₂/MWh);

m : Power units included in the build margin;

y : Most recent historical year (2007-2010) for which power generation data is available

Step a: Calculate the proportions of the corresponding CO₂ emissions of the solid fuel, liquid fuel and gas fuel to the total emission by the energy information available of the last year;

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (4)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (5)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (6)$$

Where:

$F_{i,j,y}$: Fuel (tce) consumed by the province j in the year y;

$COEF_{i,j,y}$: CO₂ emission coefficient of fuel i (tCO₂/tce), taking into account the carbon content and the percent oxidation of the fuel in year y;

$COAL$, OIL and GAS are the footnotes of the solid fuel, liquid fuel and gas fuel respectively.

In this monitoring period, the details are given below:

λ_{Coal}	92.86%
λ_{Oil}	0.41%
λ_{Gas}	6.73%

For the detailed information, please see the ERs spreadsheet.

Step b: Calculate the fuel-fired emission factors ($EF_{Thermal}$) of the grids based on the emissions of the best technology commercially available.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (7)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are the emission factors of coal, oil, and gas-fired power respectively using the efficiency level of the best technology commercially available in China (see ERs spreadsheet for details).

Based on the recent data ⁵ issued by Chinese DNA:

- The most advanced and commercially available coal power technology in China in 2010 is 600~1,000 MW sub-critical unit with power supply coal consumption of 309.9 gce/kWh, which is equivalent to a power supply efficiency of 39.65%
- The most advanced and commercially available oil and gas fired power technology in China's power grid is defined as 390 MW combined cycle unit with power supply coal consumption of 236.6 gce/kWh, which is equivalent to a power supply efficiency of 51.93%.

The detailed data is listed in the table below:

	Variable	Efficiency of Power Supply	Emission Factor of Fuel (kgCO ₂ /TJ)	Oxidation Factor	Emission Factor (tCO ₂ /MWh)
		A	B	C	D=3.6/A/1000000*B*C
Coal	$EF_{Coal,Adv}$	39.65%	87,300	1	0.7926
Oil	$EF_{Oil,Adv}$	51.93%	75,500	1	0.5234
Gas	$EF_{Gas,Adv}$	51.93%	54,300	1	0.3764

Thus, in this monitoring period,

$EF_{Thermal,y} = \lambda_{Coal} \times EF_{Coal,Adv,y} + \lambda_{Oil} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} =$	0.76352	t CO ₂ /MWh
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Step c: Calculate $EF_{BM,y}$ of the grid based on equation (8):

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (8)$$

Where:

CAP_{Total} : Total Change in installed capacity of ECPG, MW;

$CAP_{Thermal}$: Incremental capacity of fuel-fired power of ECPG, MW.

The detailed data is listed in the table below:

⁵ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf>

	Installed Capacity 2007	Installed Capacity 2008	Installed Capacity 2009	Installed Capacity 2010	Incremental Capacity in 2007-2010 ¹	Incremental Capacity in 2008-2010 ²	Incremental Capacity in 2009-2010 ³	Addition share
	MW	MW	MW	MW	MW	MW	MW	%
	A	B	C	D	E	F	G	H
Thermal power	138,650	148,700	157,970	172,710	52,660	37,900	20,560	90.23%
Hydro	19,970	22,240	23,300	23,630	3,660	390	330	6.27%
Nuclear	5,070	5,070	5,130	5,790	720	720	660	1.23%
Wind power and other	1,096	1,062	1,689	2,421	1,325	1,359	732	2.27%
Total	164,786	177,072	188,089	204,551	58,365	40,369	22,282	100.00%
% of installed capacity in 2008					28.53%	19.74%	10.89%	

Note 1-3 : the calculated incremental capacity after considering installed capacity, shut-down capacity and pump-storage hydroelectricity capacity.

$CAP_{Thermal}$	52,660.0	MW
CAP_{Total}	58,365.0	MW
$EF_{Thermal}$	0.76352	t CO ₂ e/MWh
$EF_{BM,y} = CAP_{Thermal} / CAP_{Total} * EF_{Thermal}$	0.6889	t CO ₂ e/MWh

During this monitoring period, the $EG_{PJ,y}$ is 350,237.8 MWh and the $EF_{grid,BM,y}$ is 0.6889 tCO₂e/MWh.

Thus,

$$BE_y = EG_{PJ,y} \times EF_{grid,BM,y} = 350,237.8 \times 0.6889 = 241,278 \text{ t CO}_2\text{e}$$

E.2. Calculation of project emissions or actual net GHG removals by sinks

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The project activity is on-site combustion of natural gas to generate electricity without auxiliary fuels in project operation. The CO₂ emissions from electricity generation (PE_y) are calculated as follows:

$$PE_y = \sum_f FC_{f,y} \times COEF_{f,y} \quad (9)$$

$$COEF_{f,y} = \sum NCV_{f,y} \times EF_{CO_2,f,y} \times OXID_f \quad (10)$$

Where:

Parameter	Description	Unit	Value
$FC_{f,y}$	Total volume of natural gas combusted during this monitoring period, which is measured both by the gas supplier and the project owner for cross-checking. To be conservative, the larger of these two values is used. (See the table below for details).	Nm ³	70,341,720
$NCV_{f,y}$	Net calorific value (energy content) per volume unit of natural gas during this monitoring period as provided by the fuel supplier	GJ/Nm ³	0.034135
$EF_{CO_2,f,y}$	CO ₂ emission factor per unit of energy of natural gas during this monitoring period.	tCO ₂ /GJ	0.0561
$OXID_f$	Oxidation factor of natural gas		100%
PE_y	Project emissions during this monitoring period	t CO ₂ e	134,703

FC_y Determination:

Monitoring Period		FC _{f,y} (Nm ³)		
From	To	Supplier Side	Project Side	Conservative Value
A	B	C	D	E=MAX(C, D)
01/01/2011	31/03/2011	70,341,720.000	69,981,002.259	70,341,720.000

Note: Please see the ERs spreadsheet for more details.

Therefore, the project emissions during this monitoring period are 134,703 t CO₂e.

E.3. Calculation of leakage

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According to the revised PDD, Leakage may result from upstream processes of fossil fuels outside of the project boundary. This includes mainly fugitive CH₄ emissions and CO₂ emissions from associated fuel combustion and flaring. In line with AM0029 version 03, as no LNG is used in the project plant in this monitoring period, only leakage emissions from using natural gas ($LE_{CH_4,y}$) are considered, which can be calculated based on following steps as mentioned in the revised PDD:

Calculation of $LE_{CH_4,y}$

According to AM0029, for the purpose of estimating fugitive CH₄ emissions, the Project participants should multiply the quantity of natural gas consumed by the project in year y with an emission factor for fugitive CH₄ emissions ($EF_{NG, upstream, CH_4}$) from natural gas consumption and subtract the emissions occurring from fossil fuels used in the absence of the project activity, as follows:

$$LE_{CH_4,y} = (FC_{f,y} \times NCV_{f,y} \times EF_{NG, upstream, CH_4,y} - EG_{PJ,y} \times EF_{BL, upstream, CH_4,y}) \times GWP_{CH_4} \quad (11)$$

Parameter	Description	Unit	Value
FC _{f,y}	Total volume of natural gas combusted during this monitoring period	Nm ³	70,341,720
NCV _{f,y}	Net calorific value (energy content) per volume unit of natural gas during this monitoring period as provided by the fuel supplier	GJ/Nm ³	0.034135
EF _{NG,upstream,CH₄,y}	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	t CH ₄ /GJ	0.000296
EG _{PJ,y}	Electricity supplied to the grid by the Project	MWh	350,237.8
EF _{BL,upstream,CH₄,y}	Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity per MWh electricity generation in the project plant	tCH ₄ /MWh	0.004876
GWP _{CH₄}	Global warming potential of methane valid for the relevant commitment period		21
LE _{CH₄,y}	Leakage emissions due to fugitive upstream methane emissions during this monitoring period	t CO ₂ e	-20,937

$EF_{BL,upstream,CH_4}$ Calculation:

According to AM0029, the emission factor for upstream fugitive CH_4 emissions occurring in the absence of the project activity ($EF_{BL,upstream,CH_4}$) should be calculated consistent with the baseline emission factor (EF_{BL,CO_2}) used in step 2, so the $EF_{BL,upstream,CH_4}$ is calculated as follows:

$$EF_{BL,upstream,CH_4} = \frac{\sum_j FF_{j,k} \times EF_{k,upstream,CH_4}}{\sum_j EG_j} \quad (12)$$

Where:

j : Plants included in the build margin;

$FF_{j,k}$: Amount of fuel k (a coal or oil type) combusted in power plant j included in the build margin;

$EF_{k,upstream,CH_4}$: Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal) in $t\ CH_4$ per MJ fuel produced.

Based on the method of calculating BM emission factor taken by the Chinese DNA, the calculation formula for $EF_{BL,upstream,CH_4}$ could be converted to:

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal,upstream,CH_4} \quad (13)$$

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,upstream,CH_4} + \lambda_{Oil} \times EF_{Oil,upstream,CH_4} + \lambda_{Gas} \times EF_{Gas,upstream,CH_4} \quad (14)$$

As the emission factor of coal, $EF_{Coal,upstream,CH_4} = 13.4\ t\ CH_4/kt\ Coal$ ⁶, is provided by AM0029 based on a mass unit, thus it needs to be converted in an energy units as of “ $t\ CH_4/MWh$ ”, which is required by the methodology. The conversion calculation is given below:

$EF_{Coal,upstream,CH_4}$ Calculation:

Parameter	Description	Unit	Value
$EF_{Coal,upstream,CH_4}$	Emission factor for upstream fugitive methane emissions from production of coal	$tCH_4/kt\ Coal$	13.4 ⁷
$CC_{coal,Adv}$	Coal consumption per kWh of the most advanced domestic technology for coal-fired power plants (sub-critical 600~1,000 MW coal power unit)	g standard coal/kWh	309.9 ⁸
$NCV_{standard\ coal}/NCV_{raw\ coal}$	The ratio of standard coal NCV and raw coal NCV		1.4 ⁹
$EF_{Coal,upstream,CH_4}$	Emission factor for upstream fugitive methane emissions from	tCH_4/MWh	0.00581

⁶ 95% of the coal in China is produced by underground mining

⁷ AM0029 default value

⁸ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf>

⁹ Chinese Energy Statistics Year Book 2011



	production of coal		
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The detailed calculation is as follows:

$$EF_{\text{Coal,upstream,CH}_4} = 13.4/1000 \times 309.9/1000 \times 1.4 = 0.00581 \text{ t CH}_4/\text{MWh}$$

The $EF_{\text{Thermal,upstream,CH}_4}$ is calculated in the table below:

Parameter	Description	Unit	Value
$EF_{\text{Coal,upstream,CH}_4}$	Emission factor for upstream fugitive methane emissions from production of coal	tCH ₄ /MWh	0.00581
$EF_{\text{Oil,upstream,CH}_4}$	Emission factor for upstream fugitive methane emissions from production of oil (AM0029 default value)	tCH ₄ /PJ	4.1
$EF_{\text{gas,upstream,CH}_4}$	Emission factor for upstream fugitive methane emissions from production of natural gas (AM0029 default value)	tCH ₄ /PJ	296
λ_{Coal}	Proportion of the corresponding CO ₂ emissions of coal to total emissions by energy information of Year 2010	-	92.86%
λ_{Oil}	Proportion of the corresponding CO ₂ emissions of oil to total emissions by energy information of Year 2010	-	0.41%
λ_{Gas}	Proportion of the corresponding CO ₂ emissions of gas to total emissions by energy information of Year 2010	-	6.73%
$EF_{\text{thermal,upstream,CH}_4}$	Fuel-fired emission factors of the grids based on the emissions of the most-advanced technology commercially available	t CH ₄ /MWh	0.005404

Note: 1MWh=3.6GJ=3.6*10⁻⁶ PJ

Therefore, the $EF_{\text{BL,upstream,CH}_4}$ is calculated as below:

$$EF_{\text{BL,upstream,CH}_4} = \frac{CAP_{\text{Thermal}}}{CAP_{\text{Total}}} \times EF_{\text{Thermal,upstream,CH}_4} = 90.23\% \times 0.005404 = 0.004876 \text{ tCH}_4 / \text{MWh}$$

90.23% is the proportion of fuel-fired power plants in the recently built installed capacity of ECPG during 2007~2010, which is released by the Chinese DNA¹⁰.

Based on these data, the leakage emissions due to fugitive upstream CH₄ emissions in this monitoring period ($LE_{\text{CH}_4,y}$) is -20,937 tCO₂e. Thus,

$$\begin{aligned} LE_y &= LE_{\text{CH}_4,y} = (FC_{f,y} \times NCV_{f,y} \times EF_{\text{NG,upstream,CH}_4,y} - EG_{\text{PJ,y}} \times EF_{\text{BL,upstream,CH}_4,y}) \times GWP_{\text{CH}_4} \\ &= (70,341,720 \times 0.034135 \times 0.000296 - 350,237.8 \times 0.004876) \times 21 = -20,937 \text{ t CO}_2\text{e} < 0. \end{aligned}$$

According to AM0029 Version 3, the Project should assume leakage as zero when the total net leakage

¹⁰ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf>

effects are negative, i.e. $LE_y = 0$.

For more detailed information please refer to ERs spreadsheet.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e)	Project emissions or actual net GHG removals by sinks (tCO ₂ e)	Leakage (tCO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO ₂ e)
Total	241,278	134,703	0	106,575

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

The annual emission reduction estimated in the revised PDD is 1,044,328 t CO₂e, which equals to 257,506¹¹ tCO₂e for this monitoring period (01/01/2011-31/03/2011, a total of 90 days). The actual emission reductions during this monitoring period are 106,575 tCO₂e, 41% of PDD estimation for corresponding period (see the table below for details).

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO₂e)	257,506	106,575

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

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The emission reductions achieved in this monitoring period is lower than estimated in the revised PDD mainly due to the decrease in Baseline emission factor (BM) compared to the revised PDD.

History of the MR

Version	Date	Remarks
1.0	25/10/2011	MR for GSP
2.0	26/11/2012	Revised according to DOE's comments and the latest build margin baseline emission factor; and switched from the VVM Track to the VVS Track.

¹¹ 90/365*1,044,328 = 257,506



History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance		



Annex 1:

Step1: Calculation of share of CO₂ emissions from solid, liquid and gaseous fuelsTable A1-1 Calculation sheet for λ_{Coal} , λ_{Oil} , λ_{Gas} of ECPG

Fuel types	unit	Provinces in the Regional Grid					Subtotal	Effective Carbon Emission Factor	Carbon Oxidation Rate	Average low Caloric value	CO ₂ Emission (tCO ₂ e)
	U	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	FC _{iy}	EF _{co2,iy} (tCO ₂ /TJ)	%	NCV _{ij} (MJ/t,m ³ ,tce)	K=F*G*H*I/100000(mass unit)
	<i>U</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F=A+B+C+D+E</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>K</i>
Raw Coal	10 ⁴ t	3,421.20	12,612.92	8,254.08	5,230.09	3,371.11	32,889.40	87,300	1	20,908	600,319,825
Cleaned Coal	10 ⁴ t	-	-	-	-	-	-	87,300	1	26,344	-
Other Washed Coal	10 ⁴ t	-	230.14	2.25	1,301.82	-	1,534.21	87,300	1	8,363	11,201,112
Briquettes	10 ⁴ t	-	-	-	-	-	-	87,300	1	20,908	-
Coal Gangue	10 ⁴ t	-	20.69	1.40	236.33	34.67	293.09	87,300	1	8,363	2,139,820
Coke	10 ⁴ t	-	-	-	-	-	-	95,700	1	28,435	-
Other Coking Products	10 ⁴ t	-	-	-	-	-	-	95,700	1	28,435	-
Total of solid fuels											613,660,758
Crude Oil	10 ⁴ t	-	-	3.23	-	-	3.23	71,100	1	41,816	96,032
Gasoline	10 ⁴ t	-	-	-	-	-	-	67,500	1	43,070	-
Diesel Oil	10 ⁴ t	0.90	1.98	1.04	-	3.19	7.11	72,600	1	42,652	220,164
Fuel Oil	10 ⁴ t	17.53	0.06	5.14	-	0.73	23.46	75,500	1	41,816	740,658
Petroleum Coke	10 ⁴ t	23.49	-	37.50	-	-	60.99	82,900	1	31,947	1,615,263
Other Petroleum Products	10 ⁴ t	0.05	1.22	-	-	-	1.27	75,500	1	41,816	40,095
Total of liquid fuels											2,712,211
Natural Gas	10 ⁷ m ³	74.70	243.90	175.30	-	190.90	684.80	54,300	1	38,931	14,476,352
LNG	10 ⁴ t	-	-	2.76	-	-	2.76	54,300	1	51,434	77,083
Coke Oven Gas	10 ⁷ m ³	6.70	108.00	2.60	52.80	1.90	172.00	37,300	1	16,726	1,073,073
Blast Furnace Gas	10 ⁷ m ³	1,060.30	1,089.50	141.90	762.20	62.10	3,116.00	219,000	1	3,763	25,678,863
Converter Gas	10 ⁷ m ³	121.90	43.10	9.50	10.90	4.60	190.00	145,000	1	7,945	2,188,848
Other Coal Gas	10 ⁷ m ³	-	-	-	-	-	-	37,300	1	5,227	-
LPG		-	-	-	-	-	-	61,600	1	50,179	-
Refinery Gas	10 ⁴ t	0.76	0.16	-	1.18	42.17	44.27	48,200	1	46,055	982,728
Total of gas fuels											44,476,947
Other energy	10 ⁴ t standard coal	15.59	112.68	49.33	28.77	1.10	207.47	-	-	-	-
Total of solid, liquid and gas fuels											660,849,916

Data Source: China Energy Statistical Yearbook 2011



The percentages of CO₂ emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO₂ emissions are ca

λ_{Coal}	92.86%
λ_{Oil}	0.41%
λ_{Gas}	6.73%

Step 2: Calculate the emission factor of thermal power.

Table A1-2 Efficiency Level of the Best Power Generation Technology Commercially

	Variable	Efficiency of Power Supply	Emission Factor of Fuel (kgCO ₂ /TJ)	Oxidation Factor	Emission Factor (tCO ₂ /MWh)
		A	B	C	D=3.6/A/1000000*B*C
Coal	EF _{Coal,Adv}	39.65%	87,300	1	0.7926
Oil	EF _{Oil,Adv}	51.93%	75,500	1	0.5234
Gas	EF _{Gas,Adv}	51.93%	54,300	1	0.3764

Data source:

1. Efficiency data of power supply is sourced from Chinese DNA

(<http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf>);

2. The emission factors and oxidation factor of fuels are sourced from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

$EF_{Thermal,y} = \lambda_{Coal} \times EF_{Coal,Adv,y} + \lambda_{Oil} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} =$	0.76352	t CO ₂ /MWh
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Step 3: Calculate BM of ECPG

Table A1-6 ECPG Installed Capacity in 2010

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Thermal power	MW	18,430	59,980	43,600	27,630	23,070	172,710
Hydro	MW	-	1,140	9,690	1,690	11,110	23,630
Nuclear	MW	-	2,120	3,670	-	-	5,790
Wind power and other	MW	154	1,460	257	-	550	2,421
Total	MW	18,584	64,700	57,217	29,320	34,730	204,551

Data source: China Electric Power Yearbook 2011

Table A1-3 ECPG Installed Capacity in 2009

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Thermal power	MW	16,540	52,420	43,300	26,790	18,920	157,970
Hydro	MW	-	1,140	9,560	1,620	10,980	23,300
Nuclear	MW	-	2,120	3,010	-	-	5,130
Wind power and other	MW	42.1	952.5	233.9	-	460	1,689
Total	MW	16,582	56,633	56,104	28,410	30,360	188,089

Data source: China Electric Power Yearbook 2010

Table A1-4 ECPG Installed Capacity in 2008

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Thermal power	MW	16,780	50,680	40,990	24,820	15,430	148,700
Hydro	MW	-	1,140	8,960	1,560	10,580	22,240
Nuclear	MW	-	2,000	3,070	-	-	5,070
Wind power and other	MW	42.2	610	150	-	260	1,062
Total	MW	16,822	54,430	53,170	26,380	26,270	177,072

Data source: China Electric Power Yearbook 2009

Table A1-5 ECPG Installed Capacity in 2007

Installed Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Thermal power	MW	14,150	53,340	39,490	17,760	13,910	138,650
Hydro	MW	-	140	8,520	1,510	9,800	19,970
Nuclear	MW	-	2,000	3,070	-	-	5,070
Wind power and other	MW	268.8	517.8	40	-	269	1,095.6
Total	MW	14,418.8	55,997.8	51,120	19,270	23,979	164,785.6

Data source: China Electric Power Yearbook 2008



Table A1-7 ECPG BM calculation

	Installed Capacity 2007	Installed Capacity 2008	Installed Capacity 2009	Installed Capacity 2010	Incremental Capacity in 2007-2010 ¹	Incremental Capacity in 2008-2010 ²	Incremental Capacity in 2009-2010 ³	Addition share
	MW	MW	MW	MW	MW	MW	MW	%
	A	B	C	D	E	F	G	H
Thermal power	138,650	148,700	157,970	172,710	52,660	37,900	20,560	90.23%
Hydro	19,970	22,240	23,300	23,630	3,660	390	330	6.27%
Nuclear	5,070	5,070	5,130	5,790	720	720	660	1.23%
Wind power and other	1,096	1,062	1,689	2,421	1,325	1,359	732	2.27%
Total	164,786	177,072	188,089	204,551	58,365	40,369	22,282	100.00%
% of installed capacity in 2008					28.53%	19.74%	10.89%	

Note 1-3 : the calculated incremental capacity after considering installed capacity, shut-down capacity and pump-storage hydroelectricity capacity.

$CAP_{Thermal}$	52,660.0	MW
CAP_{Total}	58,365.0	MW
$EF_{Thermal}$	0.76352	t CO ₂ e/MWh
$EF_{BM,y} = CAP_{Thermal} / CAP_{Total} * EF_{Thermal}$	0.6889	t CO ₂ e/MWh