CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Project Title: Hebei Shangyi Qijiashan Wind Farm Project
PDD version: 2.0
Date: 04/09/2008

A.2. Description of the project activity:

The proposed Hebei Shangyi Qijiashan Wind Farm Project is located in the north-east of Shangyi County, Hebei province, China, developed by Guohua (Hebei) Renewable Energy Co., Ltd (hereafter as "the developer"). The objective of the project is to generate renewable electricity from wind power and sell the generated power to the North China Power Grid (NCPG).

On the project site, the developer is planning to install 133 wind turbines, each with a capacity of 1.5MW. The total installed capacity of the proposed project activity is will be 199.5MW. The expected net annual generation of the project activity is 462,060MWh and the expected volume of emission reductions is 417,795 tCO2e per year.

The baseline scenario of the proposed project is the additional provision of comparable electricity generated by the NCPG. As the NCPG is dominated by the thermal power generation, the proposed project activity will achieve greenhouse gas (GHG) emission reductions by displacing the electricity from NCPG.

The project activity will promote the local and national sustainable development powerfully in the following aspects:

- Reduce greenhouse gas emissions in China compared to a business-as-usual scenario;
- Help to stimulate the growth of the wind power industry in China;
- Create local employment opportunity during the assembly and installation of wind turbines, and for operation of the wind farm;
- Reduce other pollutants resulting from the power generation industry, compared to a business-as-usual approach, such as SO_2, NO_x and soot.

A.3. Project participants:

Name of Party involved	Private and/or public entity(ies) project participants (as applicable)	Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	Guohua (Hebei) Renewable Energy Co., Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Carbon Resource Management Ltd.	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

A.4.1.2. Region/State/Province etc.:

Hebei Province

A.4.1.3. City/Town/Community etc.:

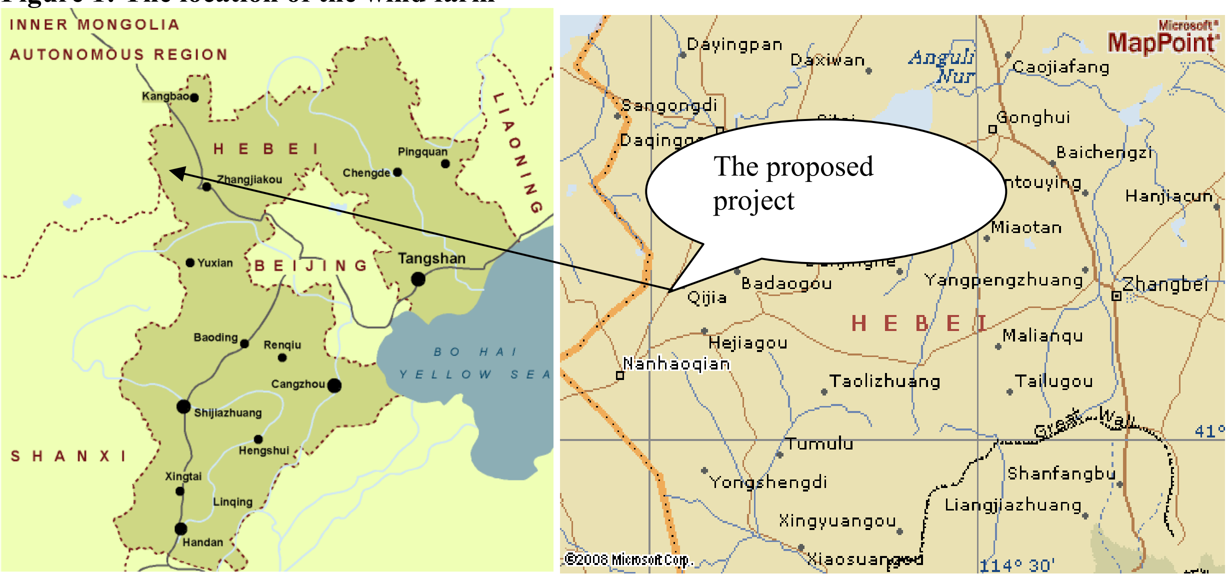
Shangyi County, Zhangjiakou City

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project activity lies in the East of Shangyi County, 30 kilometres from the Shangyi County. The project is located at latitude 41°11′35″~ 41°19′57″ North and longitude 114°01′35″~114°09′05″ East. The altitude of the project site is 1390m - 1480m above sea level.

Figure 1 shows the location of the project.

Figure 1: The location of the wind farm



A.4.2. Category(ies) of project activity:

Sectoral Scope: 1. Energy Industries (Renewable sources).

A.4.3. Technology to be employed by the project activity:

The project developer adopts advanced commercial wind-power technology for the construction of this proposed project activity. A total of 133 turbines with a capacity 1.5MW will be installed: 40 turbines (SL1500/77) are manufactured by Sinovel Windtec Co., Ltd., and 93 turbines (GE1.5CWE) are manufactured by GE Energy (Shenyang) Co., Ltd. The detailed parameters of the turbines are provided in Table 1. The turbine manufacturer will provide on-the-job-training for staff of the proposed wind farm before the start of operation.

The project scenario is the installation of 133 wind turbines with an aggregate capacity of 199.5MW. The net generation is expected to be 462,060MWh per year. The proposed project is expected to be operated for 20 years.

Table 1 The main technical specifications of the installed wind turbines

Item	Sinovel Windtec	GE Energy
Type	SL1500/77	GE1.5CWE
Quantity	40	93
Rated capacity (kW)	1500	1500
Hub height (m)	64.7	64.7
Rotor diameter (m)	77.4	70.5
Sweep-wind area (m^2)	4657	3904
Cut-in speed (m/s)	3	4
Rated wind speed (m/s)	11	14
Cut-out speed (m/s)	20	28
Rotor speed (rpm)	9.7-19	11.1-22.2
Rated voltage of generator (V)	690	690

A 220kV transformer station will be built at the project site. The power generation from the proposed project will send to the grid by 220kV transmission line. The net electricity supplied by the proposed project activity to the grid will be monitored through the main meter installed in Zhangbei substation, recording exports to the grid (supply) and imports from the grid (consumption). There will be also electric meters in the substation of the wind farm as backups.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

The project will achieve an ex-ante estimated average emission reduction of 417,795 tCO_2 per year over the chosen 7-year renewable crediting period, as presented in Table 2 below.

The baseline emissions factor has been fixed for the first crediting period. The amount of CERs actually generated by the project will vary based on the metered power supply of the project.

Table 2 Estimated emission reductions of the project in the first crediting period

Years*	Annual estimation of emission reductions (tCO2e)
2009	183,247
2010	304,180
2011	487,427
2012	487,427
2013	487,427
2014	487,427

2015	487,427
Total estimated reductions (tCO_2e)	2,924,562
Total number of first crediting years	7
Annual average over the crediting period of estimated reductions (tCO_2e)	417,795

**Note: Using12-month period from the start of crediting period*

A.4.5. Public funding of the project activity:

There is no public funding from Annex I Parties for this project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

Approved methodology: *ACM0002 Consolidated methodology for grid-connected electricity generation from renewable sources* (Version 7, valid from 14 Dec 07 onwards)

Tools referenced in this methodology:
AM_Tool_01 "Tool for the demonstration and assessment of additionality"
Version 05.2 (EB 39 Annex 10)
AM_Tool_07 "Tool to calculate the emission factor for an electricity system"
Version 01.1 (EB 35 Annex 12)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The approved methodology ACM0002 is applicable to the project activities, because:

- The project involves electricity capacity additions to the grid from wind power resources; and
- The project does not involve switching from fossil fuels to renewable energy at the site of the project activity; and
- The geographic and system boundaries of the NCPG can be clearly identified and information on the characteristics of the grid is public available.[1]

B.3. Description of the sources and gases included in the project boundary:

Emission sources:

For the baseline determination only CO_2 emissions from electricity generation by fossil fuel fired power plant that is displaced due to the project activity are taken into account.

Spatial boundary:

The spatial extend of the project boundary includes the project site and all power plants connected to NCPG. NCPG is an electricity system which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constrains.

Using the boundary definitions of the Chinese DNA[2], NCPG consists of Shandong, Beijing, Tianjin, Hebei, Shanxi, and Inner Mongolia power grids. The electricity transmission between different provinces in NCPG is very large and it is reasonable for the project to regard NCPG as the project boundary.

NCPG connects with Northeast Power Grid (NEPG) and Central China Power Grid (CCPG); the electricity transfers are from NEPG and CCPG to NCPG. Electricity transfers from NEPG and CCPG, therefore, are

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[1] The boundary of NCPG is defined by Chinese DNA on 15/12/2006 with the linkage of http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf.
[2] Chinese DNA designates it at http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf.

taken into account.

Table 3 Sources and gases in the project boundary

Source		Gas	Included?	Justification / Explanation
Baseline	Grid	CO_2	Yes	Following ACM0002
		CH_4	No	Conservative / according to ACM0002
		N_2O	No	Conservative / according to ACM0002
Project activity	Fossil fuel use	CO_2	No	According to ACM0002, the project emission of wind power project activity is not considered.
		CH_4	No	
		N_2O	No	

Figure 2 Flow diagram of the project boundary

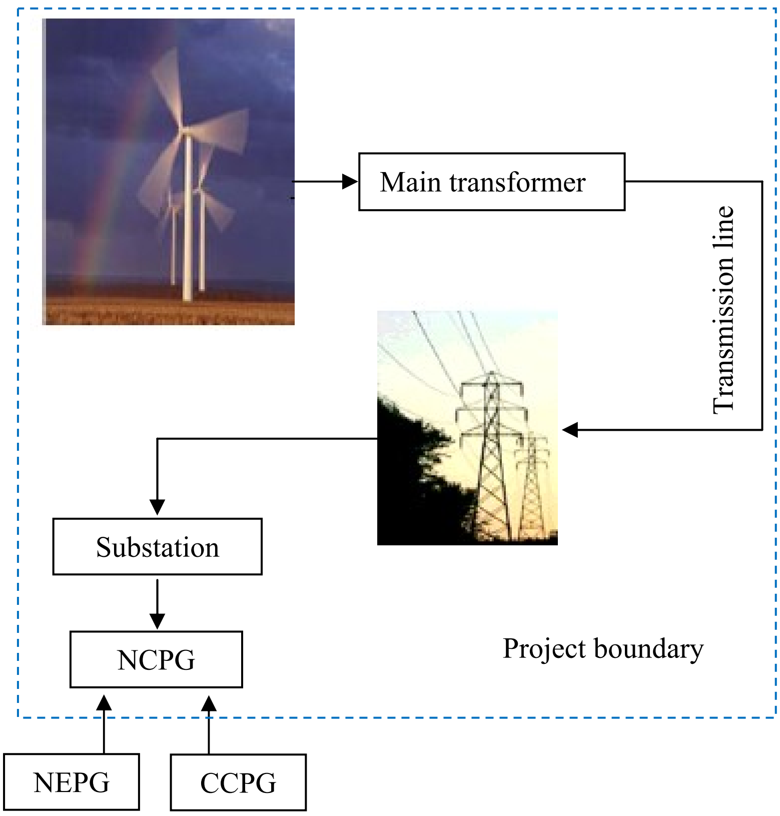

Figure 2: The project boundary figure

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

Because the project activity is the installation of a new grid-connected wind power plant/unit, and is not a modification/retrofit of an existing plant/unit, the baseline scenario, according to methodology ACM0002, is the following:

"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

Prior consideration

The project developer had the CDM application consideration at the early stage of project design period. Based on the FSR and the expected revenues of the project, it is clear that the project will be unattractive to the developer and thus face the financing obstacle, therefore, the project developer had a detailed analysis on the CDM project application, after that it is concluded that with the CERs revenues, the project will be attractive and overcome the financial obstacle. Therefore, the project developer held a directorate meeting and decided to apply for CDM project, after signing with the CERs purchaser, the developer decided to start the project construction.

As also shown in the common practice analysis below, and based on years of experience since the first approved wind farm CDM project[3], new wind energy investments in China are all considered as CDM projects. Many wind farms have already registered, or are in the process of doing so, in China.

Additionality

According to ACM0002, the additionality of the project activity is demonstrated and assessed using the latest version of *AM_Tool_01 "Tool for the demonstration and assessment of additionality"*. The tool uses the following steps:

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Realistic and credible alternatives to the project activity are defined through the following sub-steps:

Sub-step 1a. Define alternatives to the project activity:

Alternatives that provide outputs or services comparable to the proposed CDM project activity include:

- *(a) The project activity undertaken without being registered as a CDM project activity.*
- *(b) Thermal power plant with comparable capacity or electricity generation;*
- *(c) Other renewable energy with comparable capacity or electricity generation.*
- *(d) Continuation of the current situation: Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.*

The alternative (a) is fully in accordance with current Chinese law and regulations. However, the financial analysis below shows that the IRR of the project is below industry benchmark without CERs revenue, so it is

[3] Project 0064 Huitengxile Windfarm Project, registered in June 2005.

financially not attractive. Therefore, the project activity undertaken without being registered as a CDM project activity is not a realistic alternative.

The proposed project activity is expected to generate 462,060 MWh per year once fully operational, which is equivalent to the output of 82.33 MW of fossil fuel-fired capacity at the average load factor.[4] However, according to Chinese regulations, coal-fired power plants of less than 135MW are prohibited from being built in areas covered by the large grids such as provincial grids. Therefore, a fossil fuel fired power plant that delivers comparable outputs as described in alternative (b), conflicts with Chinese regulations and practice. Alternative (b), therefore, is not a realistic alternative.

Other renewable energy technologies are possible alternative grid-connected power generation sources that could be used in China. However, due to the technology development status and the high cost for power generation, solar PV, geothermal and biomass of similar installed capacity as the project are not realistic alternatives in China[5]. Only hydropower projects can have an investment return rate that competes with that of wind power projects in China.[6] However, there is no exploitable hydro power resource in this area of the project activity. Therefore, alternative (b2) is not realistic.

To meet the increasing electricity demand, the power grid company can increase the generation from operating units as well as from new built (thermal) power plants connected to the grid. Indeed, this is the current route followed by the industry to meet demand, as reflected in the baseline calculations data presented: more than 99% of recently added capacity is thermal power. Therefore, continuation of the current situation, with the electricity generated by the operation of grid-connected power plants and by the addition of new generation sources on NCPG is taken as a realistic alternative for the project activity.

From the above mentioned we know that alternative (d) is the baseline scenario of the project, in line with the methodology.

Sub-step 1b. Consistency with mandatory laws and regulations:

According to Chinese regulations, coal-fired power plants of less than 135MW are prohibited from being built in areas covered by the large grids such as provincial grids[7]. Therefore, a fossil fuel fired power plant delivering a comparable volume of electricity generation, which would be 82.33MW[8], as described in alternative (b) in sub-step 1a, conflicts with Chinese regulations and practice. So, alternative (b) is not a realistic alternative.

The other alternatives described in sub-step 1a are all in compliance with applicable legal and regulatory requirements. However, only alternative (d) continuation of the current situation, with the electricity generated by the operation of grid-connected power plants and by the addition of new generation sources on NCPG is a realistic alternative consistent with current laws and regulations. Indeed, it is very common in the

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[4] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. 2002-6. China Electric Power Yearbook 2007, P626.
[5] http://jjckb.xinhuanet.com/cjxw/2007-11/27/content_75467.htm
http://finance.people.com.cn/GB/1038/59942/59949/6294546.html.
[6] http://www.chinaenergy.gov.cn/news.php?id=15688.
[7] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. 2002-6.
[8] According to the *China Electric Power Yearbook, Page 626 (2007 Edition), China Electric Power Press*, the average annual utilisation rate of thermal power units in China in 2005 was 5612 hours.

power grid to increase the generation output of some operating units to satisfy the load demand.

Step 2. Investment analysis

The purpose of this step is to determine whether the project activity is economically or financially less attractive than the alternatives, or economically or financially not feasible, without the revenue from the sale of certified emission reductions (CERs).

To conduct the investment analysis, the following sub-steps are used:

Sub-step 2a. Determine appropriate analysis method

This step determines whether to apply the simple cost analysis, investment comparison analysis or benchmark analysis (sub-step 2b):

The project activity generates financial benefits by the sales of electricity, so the simple cost analysis (Option I) should not be applied. The alternative to the project activity is the supply of electricity from a grid, which is not considered an investment, and a benchmark approach is considered appropriate, according to EB Guidance.[9] The investment comparison analysis (Option II), therefore, is not suitable, and the benchmark analysis (Option III) is adopted.

Sub-step 2b – Option III. Apply benchmark analysis

Identify the relevant benchmark value which represents standard returns in the market, and compare the financial indicators of the proposed CDM project with the benchmark value.

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*[10], the benchmark of total investment financial internal rate of return (IRR) of electric power industry is 8%, and only if the total investment IRR of the project is higher than or equivalent to this benchmark, the project is financially feasible. This benchmark is widely used in assessment and approval of Chinese electricity power industrial, especially new projects, and is applied by many Chinese wind farm projects under the CDM. Therefore, the project activity uses the benchmark of 8% in the financial analysis.

Sub-step 2c. Calculation and comparison of financial indicators:

The investment estimation in the Feasibility Study Report (FSR) is based on national regulation, material and equipment price levels and was carried out by an independent design institute. The relevant data is listed in Table 4.

Table 4 Relevant indicators for financial assessment

Item	Value
Net supplied power to the grid	462,060 MWh/y
Total investment	1947.6 million RMB Yuan
Annual O&M costs	27.04 million RMB Yuan
	36.75 million RMB Yuan

[9] EB 41 Annex 45 (paragraph 15).
[10] Issued by State Power Corporation of China in 2002.

Expected operational lifetime	20 Years
On-grid tariff (including VAT)	0.5006 RMB / kWh
	0.3504 RMB / kWh
Interest rate	7.83%
Value added tax rate	8.5%
Income tax rate	25%

It can be seen in the IRR calculation spreadsheet (in the annex to the PDD) that the IRR without CER revenue is 6.2%, which is below the benchmark 8%. The proposed project activity without registration as a CDM project, therefore, is not financially attractive to the project developer.

Table 5 Total investment analysis of the proposed project

IRR		Benchmark
without CERs	**With CERs**	
6.2%	**10.0%**	**8%**

Note: CERs price assumed to be EUR 10 / CERs.

The IRR of the project is only 6.2%, less than the benchmark IRR (8%), without CERs sale revenue, so the project faces a financial barrier and is not financially attractive to investors. The IRR is improved significantly and exceeds the benchmark IRR with CER sales revenues. Therefore, the registration of the proposed project activity as a CDM project activity will be very important to overcome the financial barrier, by offering greater returns and improving the confidence of the project developer and the bank.

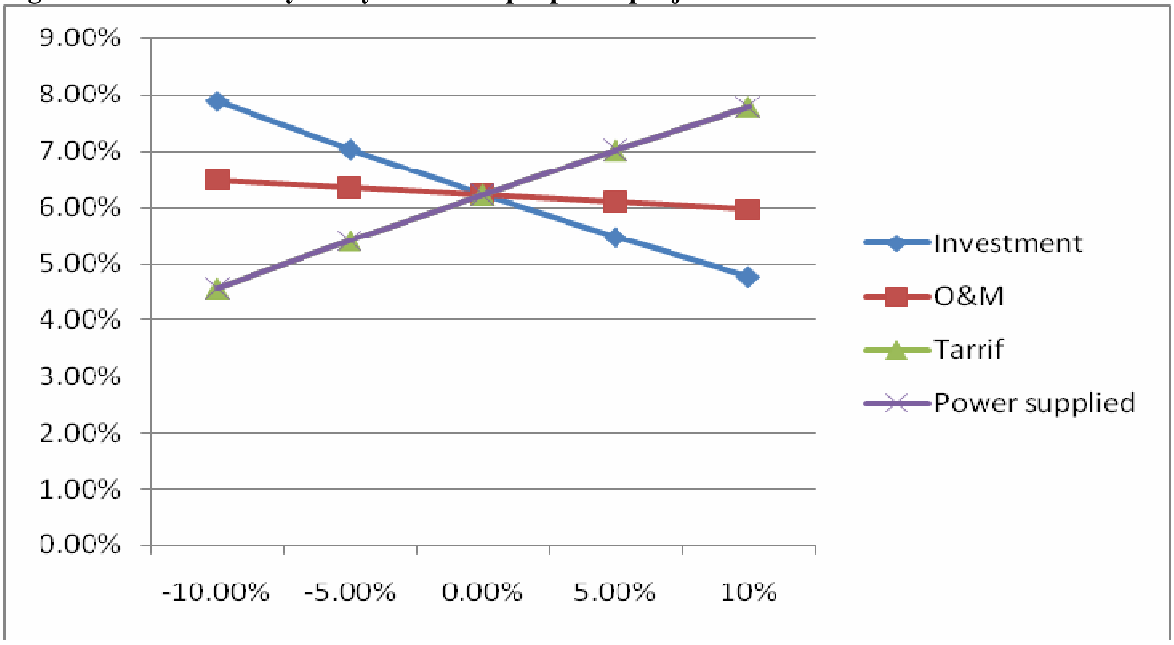
Sub-step 2d. Sensitivity analysis

A sensitivity analysis is used to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions, the result of the sensitivity analysis is shown in Figure 3. The most important parameters impacting the IRR are:

- Total investment
- Annual Operation and Maintenance costs
- On-grid tariff
- supplied power

In the sensitivity analysis, variations of ±10% have been considered in these most important parameters. The results of the sensitivity analysis for the IRR are shown in Figure 3.

Figure 3 IRR sensitivity analysis for the proposed project



Variations of -10% to +10% from the original assumptions for each of the critical variables are used in line with the regulations.

Figure3 shows that the IRR of the project is unlikely to reach the benchmark 8% without CERs revenue when these financial indicators above fluctuate within the range of -10% to +10%. Therefore, the proposed project is not financially feasible without the revenue of CERs, thus it is additional.

→ If after the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be the most financially attractive (as per step 2c para 8a) or is unlikely to be financially attractive (as per step 2c para 8b), then proceed to Step 3 (Barrier analysis) or Step 4 (Common practice analysis).

The financial analysis shows that the project is not the most financially attractive alternative, and the sensitivity analysis shows that it is unlikely to be financially attractive under reasonable variations in the assumptions.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the project activity:

In line with the guidance from the additionality tool the common practice analysis is carried out on the basis of similar projects in the same region and take place in a comparable environment with regards to regulatory framework, investment climate etc.

Using the statistics of installed capacity of wind power in China in 2006, by Professor Shi Pengfei[11], the wind farm projects connected to the same grid (NCPG) and of similar scale (exceeding 50MW) are all CDM

[11] http://www.cwea.org.cn/download/display_info.asp?cid=&sid=&id=19

projects. CDM project activities should not be included in this analysis. Therefore, it can be concluded that there are no similar activities to the proposed project activity, and that the project is not common practice.

Sub-step 4b. Discuss any similar options that are occurring:

As already described in the statement above, currently there are no wind farm projects with similar capacity connected to the NCPG that are not CDM projects. Therefore it can be concluded that the proposed project is not common practice.

→ If Sub-steps 4a and 4b are satisfied, i.e. similar activities cannot be observed or similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the project activity is additional.

In conclusion, all the steps above are satisfied, the proposed CDM project is not the baseline scenario, and the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

1. Baseline emissions (BE_y)

Following the methodology, the baseline emissions (BE_y) are the CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The emissions are calculated from the net electricity delivered to the grid by the project activity (EG) and the combined margin emissions factor (EF) as described in the "Tool to calculate the emission factor for an electricity system":

$$BE_y = (EG_y – EG_{baseline}) * EF_y$$

Where:
BE_y is the baseline emissions in year y
EG_y is the net electricity supplied by the project activity to the grid in year y
$EG_{baseline}$ is the baseline electricity supplied to the grid. For new power plants this value is zero.
EF_y is the combined margin emission coefficient calculated using the 'Tool to calculate the emission factor for an electricity system'

As $EG_{baseline}$ is zero, this is simplified to:

$$BE_y = EG_y * EF_y$$

Using the 'Tool to calculate the emission factor for an electricity system' EFy is calculated in the following 6 steps:

Step 1: Identify the relevant electric power system.
Step 2: Select an operating margin (OM) method.
Step 3: Calculate the operating margin emission factor according to the selected method.
Step 4: Identify the cohort of power units to be included in the build margin (BM).
Step 5: Calculate the build margin emission factor.
Step 6: Calculate the combined margin (CM) emissions factor.

Details of the calculations and data follow the published data from the Chinese DNA and official national statistics (China Energy Statistical Yearbook and China Electric Power Yearbook), and are also given in Annex 3 of the PDD.

Calculation of the grid emissions factor

The displaced electricity for the recipient facility is supplied by the grid, NCPG, the CO_2 emission factor of the electricity, $EF_{ELEC,grid,j,y}$ is determined following the guidance in the "Tool to calculate the emission factor for an electricity system". The project participants therefore apply the six steps from the tool.

Step 1. Identify the relevant electric power system

The proposed project activity is connected to the Hebei Provincial Grid, which is part of the North China

Power Grid (NCPG). Based on the definitions in the tool, the spatial extent of the project electricity system is the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. In line with this definition, and using the boundary definitions of the Chinese DNA[12], NCPG consists of Shandong, Beijing, Tianjin, Hebei, Shanxi, and Inner Mongolia power grids. The electricity transmission between different provinces in NCPG is very large and it is reasonable for the project to regard NCPG as the project boundary.

There are electricity transfers from connected electricity systems to the project electricity system, NCPG. The connected electricity system is the Northeast Power Grid (NEPG) and Central China Power Grid (CCPG). The Northeast Power Grid (NEPG) consists of three provincial grids: Jilin, Liaoning and Heilongjiang. The Central China Power Grid (CCPG) consists of six provincial grids: Jiangxi, Hunan, Hubei, Henan, Sichuan, Chongqing.

For the purpose of determining the operating margin, the emission factors of imports are taken into consideration. The CO_2 emission factor for net electricity imports ($EF_{grid,import,y}$) from the connected electricity system should be determined using one of the following options:

(a) 0 tCO_2/MWh, or
(b) The weighted average operating margin (OM) emission rate of the exporting grid, or
(c) The simple operating margin emission rate of the exporting grid, if the conditions for this method apply to the exporting grid; or
(d) The simple adjusted operating margin emission rate of the exporting grid.

Option (b) is selected to calculate the CO_2 emission factor(s) for net electricity imports ($EF_{grid,import,y}$), determined as described in step 3 (d) of the tool. The values of the emission factor as determined and published by the Chinese DNA are used for the imports.

Step 2. Select an operating margin (OM) method

According to the tool, the calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

a) Simple OM;
b) Simple adjusted OM;
c) Dispatch data analysis OM;
d) Average OM

Any of the four methods can be used by the project participants, however, the Simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years.

Option a is selected by the project participants. The Simple OM method is applicable, as generation from all sources (including hydro power) other than thermal plants were less than 1% of total generation in NCPG in each of the last 5 years (see annex 3).

[12] Chinese DNA designates it at http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf.

The Simple OM emissions factor can be calculated using either ex-ante or ex-post data vintages. The project proponents have chosen to use the ex-ante option, and $EF_{grid,OM,y}$ is fixed for the duration of the first crediting period:

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period. The three most recent years for which data is available are 2004-2006.

Step 3. Calculate the operating margin emission factor according to the selected method

The Simple Operating Margin emission factor $EF_{grid,OM,y}$ is defined as the generation-weighted average emissions per unit net electricity generation (tCO2/MWh) of all generating sources serving the system, not including low-cost / must-run power plants. Three options can be selected to calculate the simple OM:

- Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A); or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B); or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C).

As data for options A and B are not available, the published DNA data uses option C for the calculation of the operating margin emission factor, and the project participants follow the DNA data.

As Option C is used, the Simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{co_2,i,y}}{EG_y} \qquad \textit{(Tool: 5)}$$

Where

$EF_{grid,OMsimple,y}$ is the simple operating margin CO_2 emission factor in year y (tCO_2/MWh);

$FC_{i,y}$ is the amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit);

$NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit);

$EF_{CO2,i,y}$ is the CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ);

EG_y is the net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh);

i is all fossil fuel types combusted in power sources in the project electricity system in year y; when using the ex-ante option, is the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation.

$EF_{grid,OMsimple,y}$ is calculated to be 1.1169 tCO2/MWh (see Annex 3 for detail).

Step 4. Identify the cohort of power units to be included in the build margin

The sample group of power units m used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.[13] This option is chosen as it comprises larger annual generation than the five units built most recently. Following the deviation[14], the latest statistical data available (from the China Power Yearbook) is used by the DNA to determine the most recent year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2006. The added generation capacity is the sample group of power units *m* used to calculate the build margin.

In terms of vintage of data, project participants can choose between ex-ante, and ex-post data vintages. The project proponents have chosen to use the ex-ante option, and $EF_{grid,BM,y}$ is fixed for the duration of the first crediting period.

- Ex-ante option: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Step 5. Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad \textit{(Tool: 12)}$$

Where

$EF_{grid,BM,y}$ is the build margin CO_2 emission factor in year y (tCO_2/MWh);

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

$EF_{EL,m,y}$ is the CO_2 emission factor of power unit m in year y (tCO_2/MWh);

m is the power units included in the build margin;

y is the most recent historical year for which power generation data is available.

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 3 (a) for the simple OM. Due to the limited availability of publicly available data, the DNA uses the accepted

[13] If 20% falls on part capacity of a unit, that unit is fully included in the calculation.

[14] Deviation for projects in China (DNV, 7 Oct 05), see http://cdm.unfccc.int/Projects/Deviations.

deviation mentioned in Step 4 to calculate $EF_{BM,y}$, as follows:

- Use of capacity additions for estimating the build margin emission factor for grid electricity.
- Use of weights estimated using installed capacity in place of annual electricity generation.
- Using the latest statistical data available from China Energy Statistical Yearbook to calculate the different CO_2 emission percentage (λ_i) of solid, liquid and gas fuel in the total emission from thermal generation in the North China Power Grid.
- Based the emission percentage (λ_i) of different kind fossil fuels and the corresponding emission factor (EF_i) according to the best technology commercially available in the China, the weighted emission factor of thermal power ($EF_{thermal}$) is calculated.
- Using the latest statistical data available (from the China Electric Power Yearbook) determine the year from which the added generation capacity is equal to or just exceeds 20% of the capacity of the latest statistic year 2006. Regarding the added generation capacity above 20%, calculate the Build Margin through multiply the weighted emission factor of thermal power ($EF_{thermal}$) by the capacity percentage of the thermal power among the about 20% new capacity of 2006.

$EF_{grid,BM,y}$ is calculated to be 0.8687 tCO_2/MWh (see Annex 3 for detail).

Step 6. Calculation of the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \quad \textit{(Tool: 13)}$$

Where
$EF_{grid,BM,y}$ is the build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ is the operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM} is the weighting of operating margin emissions factor (%)
w_{BM} is the weighting of build margin emissions factor (%).

For wind farm projects the default weights W_{OM} and W_{BM} are 75% and 25% respectively.

With both EFOM and EFBM fixed in this PDD for the first crediting period, EF is also fixed for the first crediting period. The emission factor will be revised at the renewal of the crediting period.

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y}$$

$$= 1.1169 \times 0.75 + 0.8687 \times 0.25$$
$$= 1.0549 \text{ } tCO_2/MWh$$

Having determined the combined margin emission fact, the baseline emissions (BEy) can now be calculated as the emission factor multiplied by the annual net generation of the project as described above.

2. Leakage emissions (L_y)

The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects – see applicability conditions above). In line with the methodology, the project participants do not need consider these emission sources as leakage in applying this methodology.

$L_y = 0$

3. Emission reductions (ER_y)

Emission reductions are calculated as the baseline emissions minus project and leakage emissions. With leakage emissions equal to zero, emission reductions therefore are equivalent to the baseline emissions, as follows:

$ER_y = BE_y – L_y = BE_y – 0$
Therefore:

$ER_y = BE_y = EG_y \times EF_y$

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume
Description:	the amount of the fossil fuel i consumed in the project electricity system in year y
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The available data were published by the Chinese DNA, and officially accepted by the Chinese DNA in their emission factor calculations.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	GJ/mass or volume unit
Description:	Net caloric value of fossil fuel type i consumed in the project electricity system in year y
Source of data used:	China Energy Statistic Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The available data were published by the Chinese DNA, and officially accepted by the Chinese DNA in their emission factor calculations.
Any comment:	

Data / Parameter:	$EF_{CO2,i,y}$ and $EF_{CO2,m,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type i in year y

Source of data used:	IPCC 2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	The Chinese DNA has officially adopted, for their emission factor calculations, the IPCC default values were used.
Any comment:	

Data / Parameter:	$EG_{grid,y}$ and $EG_{m,y}$
Data unit:	MWh
Description:	Electricity supplied to power grid by included sources in year y
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The available data were published by the Chinese DNA, and officially accepted by the Chinese DNA in their emission factor calculations.
Any comment:	

Data / Parameter:	$\eta_{m,y}$
Data unit:	%
Description:	Conversion efficiency of the best commercially available coal, oil, or gas-fired power plant
Source of data used:	http://cdm.ccchina.gov.cn/web/main.asp?ColumnId=25
Value applied:	Best efficiency for coal plant is 37.28%; Best efficiency for oil plant is 48.81% Best efficiency for gas plant is 48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The available data were published by the Chinese DNA, and officially accepted by the Chinese DNA in their emission factor calculations.
Any comment:	

Data / Parameter:	Installed Capacity
Data unit:	MW
Description:	Installed capacity of the NCPG
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The available data were published by the Chinese DNA, and officially accepted by the Chinese DNA in their emission factor calculations.
Any comment:	

Data / Parameter:	Electricity imports
Data unit:	MWh
Description:	Net import electricity from NEPG and CCPG to NCPG
Source of data used:	China Electric Power Yearbook (2005, 2006, 2007); http://www.sp.com.cn/zgdl/spw/12y/wsdljh.htm
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The available data were published by the Chinese DNA, and officially accepted by the Chinese DNA in their emission factor calculations.
Any comment:	

Data / Parameter:	EF_{CM}
Data unit:	tCO2/MWh
Description:	Combined margin emission factor of the grid
Source of data used:	Calculated value
Value applied:	1.0549
Justification of the choice of data or description of measurement methods and procedures actually applied :	Taken from Chinese DNA, see http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2876 . Original data used are the IPCC default values from the 2006 IPCC Guidelines for National Greenhouse gas Inventories, Volume 2, Energy.
Any comment:	

Data / Parameter:	EF_{OM} (also EF_{grid},$OM_{simple,y}$)
Data unit:	tCO_2/MWh
Description:	Operating Margin Emission Factor
Source of data used:	Calculated
Value applied:	1.1169
Justification of the choice of data or description of measurement methods and procedures actually applied :	Taken from Chinese DNA, see http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2876 . Original data used are the IPCC default values from the 2006 IPCC Guidelines for National Greenhouse gas Inventories, Volume 2, Energy.
Any comment:	

Data / Parameter:	EF_{BM}
Data unit:	tCO_2/MWh
Description:	Build Margin Emission Factor
Source of data used:	Calculated
Value applied:	0.8687
Justification of the choice of data or description of measurement methods and procedures actually	Taken from Chinese DNA, see http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2876 . Original data used are the IPCC default values from the 2006 IPCC Guidelines for National Greenhouse gas Inventories, Volume 2, Energy.

applied :	
Any comment:	

B.6.3. Ex-ante calculation of emission reductions:

The Baseline Emissions (BE_y, in tCO_2), for each year y, are calculated by multiplying the baseline emissions factor (*EF*, in tCO_2/MWh) by the net supplied power of the project (EG_y, in MWh), as follows:

$BE_y = EG_y \cdot EF$

The baseline emissions factor (*EF*) is calculated using operating and build margins as described in detail in section B.6.1 above.

According to the Feasibility Study Report, the proposed project activity is estimated to supply 462,060 MWh per year after full capacity is loaded. While for the first year of operation (2009), the estimated net electricity supply is 173,710 MWh and for the second year of operation, it is 288,350 MWh.

Thus, baseline emissions are calculated and presented in table 6.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Table 6 The ex-ante estimation of emission reductions of the project activity (tCO2e)

Year*	Estimation of Project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of Leakage (tonnes of CO2e)	Estimation of overall emission Reductions (tonnes of CO2e)
2009	0	183,247	0	183,247
2010	0	304,180	0	304,180
2011	0	487,427	0	487,427
2012	0	487,427	0	487,427
2013	0	487,427	0	487,427
2014	0	487,427	0	487,427
2015	0	487,427	0	487,427
Total	0	2,924,562	0	2,924,562
first Crediting time (years)		7		7
Annual average	0	417,795	0	417,795

**Note: Using12-month period from the start of crediting period*

B.7. Application of the monitoring methodology and description of the monitoring plan:

All data collected as part of the monitoring are archived electronically and kept at least for 2 years after the end of the last crediting period. 100% of the data are monitored as indicated in the table below. All measurements are conducted with calibrated measurement equipment according to relevant industry standards.

B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net electricity supplied to the grid by the project in period y
Source of data to be used:	Electricity meters (bi-directional, i.e. recording generation and consumption)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	173,710 MWh (year 1 of operation) 288,350 MWh (year 2 of operation) 462,060MWh (from year 3)
Description of measurement methods and procedures to be applied:	Electricity meters are installed at onsite transformer station, and connection point to the grid (the main meter) to monitor the power output generated. The net power outputs supplied to the grid are measured continuously and are recorded automatically. The meters at the turbines are recorded manually every day. The accuracy of the meters meets the national standard. A designated person from the grid company and the project company jointly record the readings of the meters at the connection point to the grid on the first day of each month.
QA/QC procedures to be applied:	1. The net electricity supply to the grid is double checked by receipt of sales. 2. The meters are calibrated at a regular interval by a qualified organization according to the related national standards and regulations (Chinese electricity industry regulation DL/T448). 3. A back-up meter is installed at the connection point to the grid to check the main meter. When the main meter fails to work normally, the readings of the back-up meter will be adopted. 4. Proportion of the monitored data is 100%. 5. The data will be archived electronically and on paper. 6. The data will be kept during the crediting period and two years later. 7. The main meter and back-up meter will be calibrated once per quarter by a qualified calibration organization. The other meters are calibrated annually.
Any comment:	

Data / Parameter:	**TEG_y**
Data unit:	MWh
Description:	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y
Source of data to be used:	Electricity meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	

Description of measurement methods and procedures to be applied:	Electricity meters are installed at wind turbines (the main meter) to monitor the power output generated. The accuracy of the meters meets the national standard. A designated person from the grid company and the project company jointly record the readings of the meters at the connection point to the grid on the first day of each month.
QA/QC procedures to be applied:	1. The meters are calibrated at a regular interval by a qualified organization according to the related national standards and regulations (Chinese electricity industry regulation DL/T448). 2. Proportion of the monitored data is 100%. 3. The data will be archived electronically and on paper. 4. The data will be kept during the crediting period and two years later. 5. The main meter and back-up meter will be calibrated once per quarter by a qualified calibration organization. The other meters are calibrated annually.
Any comment:	

B.7.2. Description of the monitoring plan:

An overall monitoring plan is made for the project activity. The project developer has compiled a monitoring and management manual, i.e. “The Monitoring and Management Manual for Hebei Shangyi Qijiashan Wind Farm Project”. The aim of the monitoring plan is to make sure that the net electricity generation delivered to the grid is monitored completely, consistently, reliably and precisely. The details are summarized as follows:

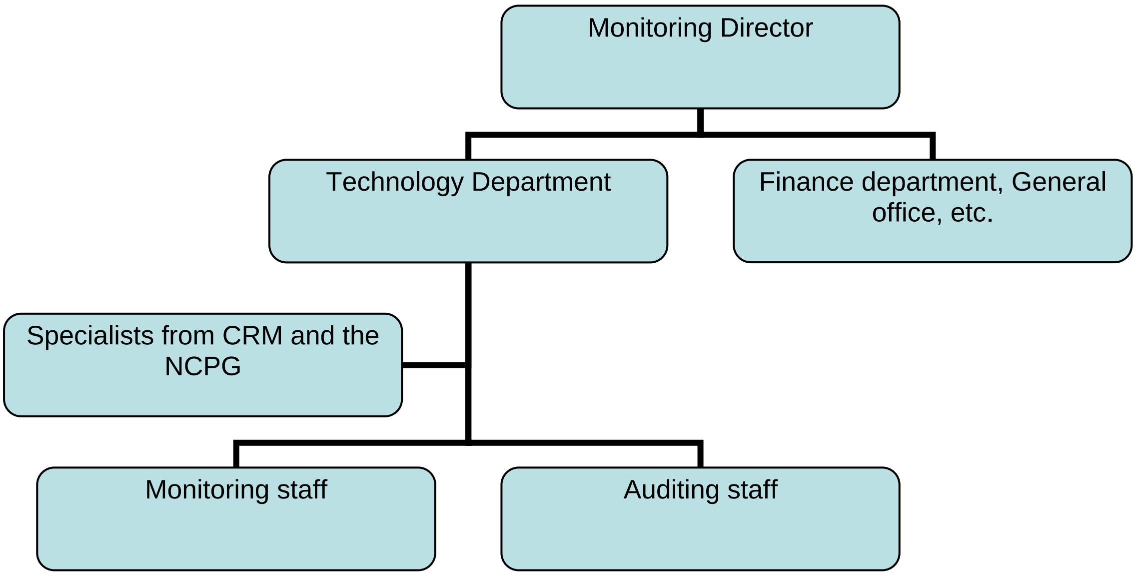
1. Monitoring subject

The main data monitored are the net electricity generation delivered to the grid by the project and total electricity produced by the project activity.

2. Monitoring management structure

In order to obtain reliable monitoring data, the project developer will establish a monitoring management framework prior to the starting of the crediting period. Clear responsibilities will be assigned to all staff involved in the CDM project. A monitoring director will be appointed who has the overall responsibilities for the monitoring of the project, other staff will be responsible for the data recording, data collecting, data archiving and emission reductions calculation. The detailed structure is as follows:

Figure 4 The CDM management structure of the project



3. Monitoring apparatus and installation:

The meters will be installed in accordance with "Technology & Management Regulations for Power Metering Devices" (DL/T448-2000). The accuracy of the meters meets the national standard. The net electricity supplied by the proposed project activity to the grid will be monitored through the main meter installed in the substation of the grid, recording exports to the grid (supply) and imports from the grid (consumption). Net generation is calculated as exports minus imports. There will also be a backup meter in substation of the wind farm, which is used to determine the net electricity in case the main meter is failed to meet the accuracy. All of the installed meters are sealed after installation or calibration.

4. Quality control

1) Calibration of meters

The calibration of meters is conducted by a qualified organization in compliance with the national standard and sectional regulations to ensure the accuracy. The main meter and back-up meter will be calibrated once per year. The meters must be sealed after calibration. The calibration records must be archived together with other monitoring records. When the main meter or back-up meter have a breakdown, the party finding the breakdown should tell another party and inform the qualified calibration organization to check, calibrate, test and treat the meter so as to recover the normal monitoring state.

2) Emergency treatment

When the main meter or back-up meter have a breakdown, the electricity generation difference will be treated as follows:
(1) When one of the two meters has a breakdown, the readings of the other meter will be adopted;
(2) If both the main meter and back-up meter have breakdowns, the net electricity supplied to the grid will be calculated from the readings of other meters and deducting the line losses.

5. Data management

All monitoring data and records will be archived in electronic format as well as on paper. The electronic documents will be backed up on compact disc or hard disc. The project developer will also keep copies of sale receipts and prepare a monitoring report at the end of each year, which includes the net electricity generation, the monitoring data summary, the calibration records, and the emission reductions calculation.

And all data including calibration records is kept until 2 years after the end of the total crediting period of the CDM project.

6. Training program

The project developer will train all related staff before the start of the crediting period. The training contains CDM knowledge, operational regulations, quality control (QC), data monitoring requirements and data management regulations, etc.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

Date of completion of the baseline study and monitoring methodology: 18/03/2008.

Contact information of the entity and persons responsible:

- Carbon Resource Management (CRM) prepared the PDD. CRM is a project participant. Contact information is given in Annex 1.
- The persons preparing the documentation were:
    - Mr. Liu Ling, Ms. Qian Yiwen, ll@carbonresource.com, Tel: +86 10 8447 5246/8
    - Mr. Christiaan Vrolijk, cv@carbonresource.com, Tel: +44 20 7016 1420.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

16/09/2008

C.1.2. Expected operational lifetime of the project activity:

20y

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

A renewable crediting period is chosen.

C.2.1.1. Starting date of the first crediting period:

01/07/2009 (or the date of registration whichever is later)

C.2.1.2. Length of the first crediting period:

7y

C.2.2. Fixed crediting period:

Not applicable.

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The Environmental Impact Assessment (EIA) for the project activity was completed by Hebei Science & Technology University Environment Impact Assessment Office.

According to the Environmental Impact Assessment (EIA), the environment impacts of the project are summarised below:

1. The analysis of the environment impact during the construction period

The environmental impacts during the construction period are as follows:

Ecological environment. The project temporarily disturbs some grass cover for construction use. The occupied land will be restored after construction. Overall, land use impact on the local residents arising from the project is considered to be insignificant.

Noise. The project will meet the restrictive construction boundary noise values during the construction stage. Therefore, the noise is not considered to negatively impact local residential areas.

Dust. The project construction region is large with good atmospheric diffusion, so the dust has little impact on the environment.

Solid-waste. The main solid-wastes produced during the construction period are construction waste and garbage from the construction workers. Garbage will be collected and will be sent to landfill. The construction wastes will be used for backfilling, foundations and road construction.

Waste water. Waste water will be treated and reused.

2. The analysis of the environment impact during operation period

The environment impacts during the construction period are as follows:

Waste water. A small quantity of waste water will be produced by the project management staff during operation. The waste water will be treated and will be used for sprinkling the vegetation.

Noise. The noise from the wind turbines is expected to be 43DB(A) at a distance of 400 meters, which meets "Industry Enterprise Factory Boundary Noise Standard". The nearest village is approximately 1500m from the turbines. Therefore, the noise of the wind farm is not considered to have a negative impact on local residents during the operational period.

Solid waste. The main solid waste during the operational period is generated by the project management staff. All the waste produced will be collected and sent to landfill.

D.2. If environmental impacts are considered significant by the project participants or the host

Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Environmental impacts are not considered significant.The Environmental Protection Bureau of Hebei Province approved the EIA.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

On May 21 2008, the project developer held a local stakeholders' meeting at the project site. During the meeting, 1 page questionnaire was designed to fill in and has the following sections:

- Project introduction
- Respondent's basic information and education level
- Questions on:

- Do you know the project?
- Do you know CDM before the meeting?
- What kind of negative impacts will the proposed project have on the environment?
- Do you think the proposed project will have promotion in local economic development?
- Will the project have a negative impact on your environment of living, studying and working?
- Do you support the construction of the proposed project?
- Do you have any suggestion about the project?

E.2. Summary of the comments received:

Following is a summary of the local survey. The survey forms are available from the project owner. The questionnaires were sent to 28 participants and had a 100% response rate. The result of the survey indicated the support to the project.

The statistic of opinion:

- Background of respondents: the participants include project developer, villagers, caste, government officers etc. The background is shown in table 7.

Table 7 Background of respondents

Age	Below 30		30～39		Above 40	
	2 persons	7.1%	11 persons	39.3%	15 persons	53.6%
Education Degree	Junior and Below		Senior		College	
	5	17.8%	8	28.6%	15	53.6%

- 60.7% participants knew about the project and 67.9% participants knew about the CDM before the meeting.
- 100% respondents believed that the project construction will not do harm to the environment.
- 100% believed that the project construction and operation will have positive impact on local economic development.
- 100% participants support construction of the project.

Conclusions from the survey:

The survey shows that the proposed project has strong local support among the local people. They all believe the proposed project will promote the local economic development and agree the project construction.

E.3. Report on how due account was taken of any comments received:

The villagers and local government are all supportive of the proposed project and to date there has been no need to modify the project design according to the comments received.

The project owner has an overall environment-friendly plan to guarantee that the project has the minimum negative impact on the environment during the project construction and operation.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Guohua (Hebei) Renewable Energy Co., Ltd
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the proposed project activity.

Annex 3

BASELINE INFORMATION

Calculation of the grid emission factor

Step 1. Identify the relevant electric power system

The proposed project activity is connected to the Hebei Provincial Grid, which is part of the North China Power Grid. Based on the definitions in the tool, the spatial extent of the project electricity system is the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. In line with this definition, and using the boundary definitions of the Chinese DNA[15], NCPG consists of Shandong, Beijing, Tianjin, Hebei, Shanxi, and Inner Mongolia power grids. The electricity transmission between different provinces in NCPG is very large and it is reasonable for the project to regard NCPG as the project boundary.

There are electricity transfers from connected electricity systems to the project electricity system, NCPG. The connected electricity system is the Northeast Power Grid (NEPG) and Central China Power Grid (CCPG). The Northeast Power Grid (NEPG) consists of three provincial grids: Jilin, Liaoning and Heilongjiang. The Central China Power Grid (CCPG) consists of six provincial grids: Jiangxi, Hunan, Hubei, Henan, Sichuan, Chongqing.

For the purpose of determining the operating margin, the emission factors of imports are taken into consideration. The CO_2 emission factor for net electricity imports ($EF_{grid,import,y}$) from the connected electricity system should be determined using one of the following options:

(e) 0 tCO_2/MWh, or
(f) The weighted average operating margin (OM) emission rate of the exporting grid, or
(g) The simple operating margin emission rate of the exporting grid, if the conditions for this method apply to the exporting grid; or
(h) The simple adjusted operating margin emission rate of the exporting grid.

Option (b) is selected to calculate the CO_2 emission factor(s) for net electricity imports ($EF_{grid,import,y}$), determined as described in step 3 (d) of the tool. The values of the emission factor as determined and published by the Chinese DNA are used for the imports.

Step 2. Select an operating margin (OM) method

According to the tool, the calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

a) Simple OM;
b) Simple adjusted OM;
c) Dispatch data analysis OM;
d) Average OM

[15] Chinese DNA designates it at http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf.

Any of the four methods can be used by the project participants, however, the Simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years.

Option a is selected by the project participants. The Simple OM method is applicable, as generation from all sources (including hydro power) other than thermal plants were less than 1% of total generation in NCPG in each of the last 5 years (see annex 3).

The Simple OM emissions factor can be calculated using either ex-ante or ex-post data vintages. The project proponents have chosen to use the ex-ante option, and $EF_{grid,OM,y}$ is fixed for the duration of the first crediting period:

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period. The three most recent years for which data is available are 2004-2006.

The Simple OM method is applicable if the low-cost / must-run resources constitute less than 50% of total grid generation on average in the five most recent years or based on long-term normal for hydroelectric production. The share of low-cost / must-run generation in NCPG does not exceed 1% in the most recent last 5 years, with the average being 0.81% as presented in Table A1 below.

Table A1 Power generation in the North China Power Grid from 2002 to 2006

year	low-cost/must-run generation 10^8kwh	Total generation 10^8kwh	Share	Sources Edition/page
2002	36.25	4075.45	0.89%	2003/P585
2003	39.79	4616.53	0.86%	2004/P709
2004	40.32	5308.04	0.76%	2005/P474
2005	45.51	6077.82	0.75%	2006/P568
2006	48.04	6099.71	0.79%	2007/P638
Total	209.41	26177.55		
Average	41.982	5235.51		

Imports

Imports into NCPG from connected electricity systems, Northeast Power Grid (NEPG) and Central China Power Grid (CCPG) are calculated using “the weighted average operating margin (OM) emission rate of the exporting grid”.

The detailed values of imports are shown in Table A2 and A3.

Table A2 Electricity exchange between power grid in 2005

unit:	100 million Kwh	MWh
North Grid Imported electricity from Northeast Grid	39.29	3,929,000
East Grid Imported electricity from Central Grid	270.39	27,039,000
Jiangsu Imported electricity from Yangcheng Plant	112.82	11,282,000
South Grid Imported net electricity from Central Grid	202.64	20,264,000

From:《Electricity Industry Statistical Document Summary 2005》

Table A3 Electricity exchange between power grid in 2006

Unit:	100 million Kwh	MWh
North Grid Imported electricity from Northeast Grid	26.1806	2,618,060
North Grid Imported electricity from Central Grid	4.9706	497,060
East Grid Imported electricity from Central Grid	24.2915	2,429,150
Jiangsu Imported electricity from Yangcheng Plant	111.5082	11,150,820
South Grid Imported net electricity from Central Grid	217.3084	21,730,840
Central Grid Imported net electricity from Northwest Grid	30.2895	3,028,950

From:《Electricity Industry Statistical Document Summary 2006》

Step 3. Calculate the operating margin emission factor according to the selected method

The most recent year for which data is available in the yearbook is the year 2006. The Operating Margin Emissions Factor is now calculated from the data presented above using formula Tool: 5, and including an adjustment for imports from NEPG and CCPG. The data and calculation is shown in Table A5 to Table A10.

Table A4 The low calorific value, carbon coefficient, oxidation factor of each fuel

fuel type	low calorific value	Carbon coefficient	Oxidation factor
Raw coal	20908 kJ/kg	25.80	1
Clean coal	26344 kJ/kg	25.80	1
Other washed coal	8363 kJ/kg	25.80	1
Moulding coal	20908 kJ/kg	26.60	1

Coke	28435 kJ/kg	29.20	1
Crude oil	41816 kJ/kg	20.00	1
Gasoline	43070 kJ/kg	18.90	1
Kerosene	43070 kJ/kg	19.60	1
Diesel	42652 kJ/kg	20.20	1
Fuel oil	41816 kJ/kg	21.10	1
Other petroleum products	38369 kJ/kg	20.00	1
Other coking products	28435 kJ/kg	25.80	1
Natural gas	38931 kJ/m3	15.30	1
Coke oven gas	16726 kJ/m3	12.10	1
Other gas	5227 kJ/m3	12.10	1
LPG	50179 kJ/kg	17.20	1
Refinery gas	46055 kJ/kg	15.70	1

Note: all of the fuel values come from 《China energy statistical yearbook 2007》 P287. Each fuel of Carbon coefficient comes from table 1.3 and table 1.4 of chapter 1 1.21-1.24 "2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy.

Table A5 Calculation of CO2 emissions from fuels for thermal power production, North China Grid, 2004.

Fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	North China Grid	Carbon coefficient	Oxidation factor	NCV	CO2 emissions （tCO_2e）
									（tc/TJ）	（%）	（MJ/t,km3）	K=G*H*I*J*44/12/10000
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (unit of volume)
Raw coal	10^4 t	823.09	1410	6300	5213	4932.2	8550	**27228.29**	25.8	100	20908	538,547,477
Clean coal	10^4 t						40	**40**	25.8	100	26344	996,857
Other washed coal	10^4 t	6.48		101	354.2		284.22	**745.91**	25.8	100	8363	5,901,191
Coke	10^4 t					0.22		**0.22**	29.2	100	28435	6,698
Coke oven gas	10^8 m^3	0.55		0.54	5.32	0.4	8.73	**15.54**	12.1	100	16726	1,153,187
Other gas	10^8 m^3	17.74		24.25	8.2	16.47	1.41	**68.07**	12.1	100	5227	1,578,574
Crude oil	10^4 t							**0**	20	100	41816	0
Gasoline	10^4 t								18.9	100	43070	0
Diesel	10^4 t	0.39	0.84	4.66				**5.89**	20.2	100	42652	186,070
Fuel oil	10^4 t	14.66		0.16				**14.82**	21.1	100	41816	479,451
LPG	10^4 t							**0**	17.2	100	50179	0
Refinery gas	10^4 t		0.55	1.42				**1.97**	15.7	100	46055	52,229
Natural gas	10^8 m^3		0.37		0.19			**0.56**	15.3	100	38931	122,306
Other petroleum products	10^4 t							**0**	20	100	38369	0

Other coking products	10^4 t							**0**	25.8	100	28435	0
Other E (standard coal)	10^4 Tce	9.41		34.64	109.7	4.48		**158.26**	0	100	0	0
											Total	**549,024,041**

《China energy statistical yearbook 2005》

MWh	Year:2004	Average EF of Northeast Grid	1.17384
import from Northeast to North	4,514,550		

Table A6 Calculation of thermal power supply to North China Grid, 2004

Province	Thermal Power generation (100 million kWh)	Thermal Power generation （MWh）	Losses （%）	Thermal power supply （MWh）
Beijing	185.8	18579000	7.94	17,103,827
Tianjin	339.5	33952000	6.35	31,796,048
Hebei	1250	124970000	6.5	116,846,950
Shanxi	1049	104926000	7.7	96,846,698
Inner Mongolia	804.3	80427000	7.17	74,660,384
Shandong	1639	163918000	7.32	151,919,202
Total				489,173,110

《China Electricity statistical yearbook 2005》

	Total Power supply MWh		493,687,660
	Total emission（tCO2）		554,323,400
year:2004		EF	1.12282

Table A7 Calculation of CO2 emissions from fuels for thermal power production, North China Grid, 2005.

Fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	North China Grid	Carbon coefficient	Oxidation factor	NCV	CO2 emissions（tCO2e）
									（tc/TJ）	（%）	（MJ/t,km3）	K=G*H*I*J*44/12/10000
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (unit of volume)
Raw coal	10^4 t	897.75	1675.2	6726.5	6176.45	6277.23	10405.4	**32158.53**	25.8	100	20908	636062535.8
Clean coal	10^4 t						42.18	**42.18**	25.8	100	26344	1051185.664
Other washed coal	10^4 t	6.57		167.45	373.65		108.69	**656.36**	25.8	100	8363	5192725.191
Coke	10^4 t					0.21	0.11	**0.32**	29.2	100	28435	9742.210133
Coke oven gas	10^8 m^3	0.64	0.75	0.62	21.08	0.39		**23.48**	12.1	100	16726	1742396.483
Other gas	10^8 m^3	16.09	7.86	38.83	9.88	18.37		**91.03**	12.1	100	5227	2111027.27
Crude oil	10^4 t					0.73		**0.73**	20	100	41816	22385.49867
Gasoline	10^4 t			0.01				**0.01**	18.9	100	43070	298.4751
Diesel	10^4 t	0.48		3.54		0.12		**4.14**	20.2	100	42652	130786.3867
Fuel oil	10^4 t	12.25		0.23		0.06		**12.54**	21.1	100	41816	405689.6325
LPG	10^4 t							**0**	17.2	100	50179	0
Refinery gas	10^4 t			9.02				**9.02**	15.7	100	46055	239141.2016
Natural gas	10^8 m^3	0.28	0.08		2.76			**3.12**	15.3	100	38931	681417.0792
Other petroleum products	10^4 t							**0**	20	100	38369	0
Other coking products	10^4 t							**0**	25.8	100	28435	0
Other E (standard coal)	10^4 t	8.58		32.35	69.31	7.27	118.9	**236.41**	0	100	0	0
											Total	647649330.9

《China energy statistical yearbook 2006》

MWh		Average EF of Northeast Grid	1.15764
import from Northeast to North	3,929,000		

Table A8 Calculation of thermal power supply to North China Grid, 2005

Province	Thermal Power generation (100 million kWh)	Thermal Power generation （MWh)	Losses （%）	Thermal power supply （MWh)
Beijing	208.8	20880000	7.73	19,265,976
Tianjin	369.93	36993000	6.63	34,540,364
Hebei	1343.48	134348000	6.57	125,521,336
Shanxi	1287.85	128785000	7.42	119,229,153
Inner Mongolia	923.45	92345000	7.01	85,871,616
Shandong	1898.8	189880000	7.14	176,322,568
Total				560,751,013

《China eletricity statistical yearbook 2006》

	Total Power supply MWh	564,680,013
	Total emission（tCO2）	652,197,698
year:2005	EF	1.15499

Table A9 Calculation of CO2 emissions from fuels for thermal power production, North China Grid, 2006.

Fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	North China Grid	Carbon coefficient	Oxidation factor	NCV	CO2 emissions（tCO_2e）
									（tc/TJ）	（%）	（MJ/t,km3）	K=G*H*I*J*44/12/10000
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (unit of volume)
Raw coal	10^4 t	796.63	1639.2	6867.99	6968.88	8404.05	10930.7	**35607.41**	25.8	100	20908	704,277,823
Clean coal	10^4 t						39.77	**39.77**	25.8	100	26344	991,125
Other washed coal	10^4 t	6.36		214.13	371.14	61.77	544.6	**1198**	25.8	100	8363	9,477,855
moulding coal	10^4 t	7.97					27.77	**35.74**	26.6	100	20908	728,820
Coke	10^4 t						3.23	**3.23**	29.2	100	28435	98,335
Coke oven gas	10^8 m^3	0.38	0.63	5.8	22.32	0.64	5.79	**35.56**	12.1	100	16726	2,638,825
Other gas	10^8 m^3	20.66	6.58	69.72	13.79	22.76	7.22	**140.73**	12.1	100	5227	3,263,593
Crude oil	10^4 t					0.74		**0.74**	20	100	41816	22,692
Gasoline	10^4 t			0.01				**0.01**	18.9	100	43070	298
Diesel	10^4 t	0.21		3.01		0.07	6.32	**9.61**	20.2	100	42652	303,589
Fuel oil	10^4 t	6.38		0.08			4.1	**10.56**	21.1	100	41816	341,633
LPG	10^4 t						0.01	**0.01**	17.2	100	50179	316
Refinery gas	10^4 t			2.43			2.32	**4.75**	15.7	100	46055	125,934
Natural gas	10^8 m^3	3.41	0.73		0.53			**4.67**	15.3	100	38931	1,019,942
Other petroleum products	10^4 t						0.28	**0.28**	20	100	38369	7,878
Other coking products	10^4 t							**0**	25.8	100	28435	0
Other E (standard coal)	10^4 Tce	6.83		47.11	230.76	12.51	132.89	**430.1**	0	100	0	0
											Total	723,298,659

《China energy statistical yearbook 2007》

MWh			
North Grid Imported electricity from Northeast Grid	2,618,060	Average EF of Northeast Grid	1.16688
North Grid Imported electricity from Central Grid	497,060	Average EF of Central Grid	0.87599

Table A10 Calculation of thermal power supply to North China Grid, 2006

Province	Thermal Power generation	Thermal Power generation	Losses	Thermal power supply
	(100 million kWh)	（MWh)	（%）	（MWh)
Beijing	207.05	20705000	7.51	19,150,055
Tianjin	359.24	35924000	6.86	33,459,614
Hebei	1438.88	143888000	6.63	134,348,226
Shanxi	1502.5	150250000	7.45	139,056,375
Inner Mongolia	1395.93	139593000	7.58	129,011,851
Shandong	2309.22	230922000	7.12	214,480,354
total		721282000		669,506,473

《China energy statistical yearbook 2007》

《China eletricity statistical yearbook 2007》

Total Power supply MWh	672,621,593
Total emission（tCO2）	726,789,038
year 05 EF	1.08053

EFom **1.1169**

Based on above data and calculations, the simple OM emission factor of NCPG is calculated ex-ante using a 3-year generation-weighed average is 1.1169 tCO_2e/MWh.

Step 4. Calculate the build margin emission factor according to the selected method

Sub-step 1: calculate the thermal emission factor

Using the data presented in Table A9, the CO_2 emission percentage of solid, liquid and gas fuel in the total emission of North China Power Grid in 2006 are calculated.

Table A11 Fuel shares in North China Grid.

Fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Shangdong	Inner Mongolia	North China Grid	NCV	Carbon coefficient	Oxidation factor	CO2 emissions（tCO_2e）
									（KJ/kg）	（tc/TJ）		K=G*H*I*J *44/12/100
		A	B	C	D	E	F	G=A+B+C +D+E+F	H	I	J	K=G*H*I*J *44/12/100
Raw coal	10^4 t	796.63	1639.2	6867.99	6968.88	10930.66	8404.05	35607.41	20908	25.8	1	704,277,823
Clean coal	10^4 t					39.77		39.77	26344	25.8	1	991,125
Other washed coal	10^4 t	6.36		214.13	371.14	544.6	61.77	1198	8363	25.8	1	9,477,855
Moulding coal	10^4 t	7.97				27.77		35.74	20908	26.6	1	728,820
Coke	10^4 t					3.23		3.23	28435	29.2	1	98,335
Coal total	10^4 t											**715,573,958**

Crude oil	10^4 t						0.74	0.74	41816	20	1	22,692
Gasoline	10^4 t			0.01				0.01	43070	18.9	1	298
Coke oil	10^4 t							0	43070	19.6	1	0
Diesel	10^4 t	0.21		3.01		6.32	0.07	9.61	42652	20.2	1	303,589
Fuel oil	10^4 t	6.38		0.08		4.1		10.56	41816	21.1	1	341,633
Other petroleum products	10^4 t					0.28		0.28	38369	20	1	7,878
Other coking products	10^4 t							0	28435	25.8	1	0
Oil total	10^4 t							**0**				**676,091**
Natural gas	10^8 m^3	34.1	7.3		5.3			46.7	38931	15.3	1	1,019,942
Coke oven gas	10^8 m^3	3.8	6.3	58	223.2	57.9	6.4	355.6	16726	12.1	1	2,638,825
Other gas	10^8 m^3	206.6	65.8	697.2	137.9	72.2	227.6	1407.3	5227	12.1	1	3,263,593
LPG	10^4 t					0.01		0.01	50179	17.2	1	316
Refinery gas	10^4 t			2.43		2.32		4.75	46055	15.7	1	125,934
Gas Total								**0**				**7,048,610**
Total												**723,298,659**

《China energy statistical yearbook 2007》

λcoal	**98.93%**
λoil	**0.09%**
λgas	**0.98%**

Sub-step 2:

Based the emission percentages (λ_i) of the different fuels and the emission factors (EF_i), according to the best technology commercially available in the China, the weighted emission factor of thermal power ($EF_{thermal}$) is calculated.

Table A12 EF calculation of coal, oil and gas

	variable	efficiency of power supply	Carbon coefficient(tc/TJ)	**Oxidation factor**	EF(tCO2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal plant	$EF_{coal,adv}$	37.28%	25.8	1	0.9135
Gas plant	$EF_{gas,adv}$	48.81%	15.3	1	0.4138
Oil plant	$EF_{oil,adv}$	48.81%	21.1	1	0.5706

So, emission factor of thermal plant is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9083 tCO_2/MWh$$

Sub-step3:

Using the latest statistical data available (from the China Electric Power Yearbook) determine the year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2006.

Table A13 Calculation of the share of thermal power in recently added capacity(MW)

	2004	2005	2006	Capacity added in 2005-2006	Share in added capacity
	A	B	C		
Thermal (MW)	93594.9	111068.7	141538	30469.3	95.64%
Hydropower (MW)	3250.7	3216.2	4004	787.8	2.47%
Nuclear (MW)	0	0	0	0.0	0.00%
Other (MW)	137.5	335.5	937	601.5	1.89%
Total (MW)	96983.1	114620.4	146479	31858.6	100.00%
Capacity addition	33.79%	21.75%			

$EF_{BM} = (CAP_{Thermal} / CAP_{Total}) * EF_{Thermal}$

$CAP_{Thermal}$ is the thermal capacity among the new capacity from 2005 to 2006, and CAP_{Total} is the total capacity from 2005 to 2006.

$EF_{BM} = 0.9083 \times 95.64\% = 0.8687\ tCO_2/MWh$

Step 6. Calculation of the combined margin emission factor

The combined margin emission factor is calculated as follows:

$EF_{grid,CM,y} = w_{OM} \bullet EF_{grid,OM,y} + w_{BM} \bullet EF_{grid,BM,} = 0.75 \times 1.1169 + 0.25 \times 0.8687 = 1.0549 tCO_2/MWh$

Annex 4

MONITORING INFORMATION

No additional information.