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:

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Title of document: Shandong Huaneng Shouguang 49.5MW Wind Farm Project
Version of document: Version 04
The date of the document: 08/01/2010

Revision history of the document:

Version of document	Date of the document	Reason for revision
Version 01	25/02/2009	
Version 02	13/07/2009	According to validation findings in the DVR issued by DOE
Version 03	09/11/2009	Revised in accordance with further comments by DOE
Version 04	08/01/2010	Revised in accordance with the findings of the Technical Review.

A.2. Description of the project activity:

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Shandong Huaneng Shouguang 49.5MW Windfarm Project (hereinafter referred as "the proposed project") is located on the west of the old river mouth, Dajiawa town, Shouguang county, Weifang City, Shandong province, P. R. China. It is designed to generate electricity from wind, a clean and renewable resource, which will provide annual net on-grid power generation of 96.4788GWh and achieve 101,765tCO_2e GHGs reductions per annum. The proposed project will install 33 IEC3 type three-blade rotor wind turbines with rated capacity of 1500KW, build a control centre including a 35kV switchyard and central control centre, and extend 110kV transmission lines for power transmission. The proposed project will be connected to Shouguang Power Grid[1] (hereinafter referred as SGPG), and then to the North China Power Grid (hereinafter referred as NCPG) finally.

The area covered by NCPG is abundant in coal and oil resources, and thermal power plant is the major power source of NCPG. By avoiding operation of existing thermal power plants and future expansion of fossil fuel-based generation by the NCPG, the proposed project will displace part of thermal power in NCPG by making use of clean and renewable energy. The proposed project will provide a combination of positive environmental, economic, and sustainable development benefits which are detailed as follows:

- Improve the general sustainability of power generation in the region and in China as a whole, contributing to national energy security in line with the long-term strategic development target;
- Stimulate the growth of the wind power industry in China, and advance the development of sustainable renewable energy industry;
- Reduce the emission of other pollutants resulting from the power generation industry in China, compared to business-as-usual scenario;
- Contribute to the development of local wind resources, the enhancement of electricity supply capacity, and the improvement of power structure;

[1] Please refer to the Power Connecting Agreement signed in 3rd December 2008 by the Project owner and the Weifang Electric Power Company.

- Bridge the energy deficiency and supply reliable and clean electricity to local area, which will benefit local industries development;
- Create local employment opportunities during the project construction and operation period: Hundreds of temporary positions were available during the construction period and 25 permanent positions during the operation period.

In terms of environmental and power benefits, the proposed project is compatible with the principle of the Chinese government to develop new energy, serving favourably for the sustainable development in China.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	Huaneng Shouguang Wind Power Co., Ltd	No
Japan	The Kansai Electric Power Co., Inc.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Shandong province

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

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Dajiawa town, Shouguang county, Weifang city, Shandong Province, China.

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

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The proposed project is located on the west of the old river mouth of Dajiawa township, Shouguang county, Weifang city, Shandong Province, P.R. China, 10km away from Dajiawa town, 40km away from Shouguang City and 150km from Qingdao city (provincial capital). Shouguang city lies in the north of Shandong province, in the middle part of Shandong peninsula and southwest to the Laizhou Bay. It is east

to the Hanting district and Weicheng district of Weifang city, south to Qingzhou city and Changle city, west to the Guangrao couty of Dongying city and north to Bohai Sea. According to the data measured by the Marine Environment Monitoring Center Station, the proposed project's geographical coordinate is longitude 118°56´59.636´´~119°02´53.821´´E and latitude 37°13´44.198´´~37°16´02.668´´N, and with its geographical coordinate of substation at longitude 118°56´59.636´´~118°57´11.300´´E and latitude 37°14´14.110´´~37°14´20.603´´N. Figure 1 and Figure 2 below show the specific geographical location of the proposed project.

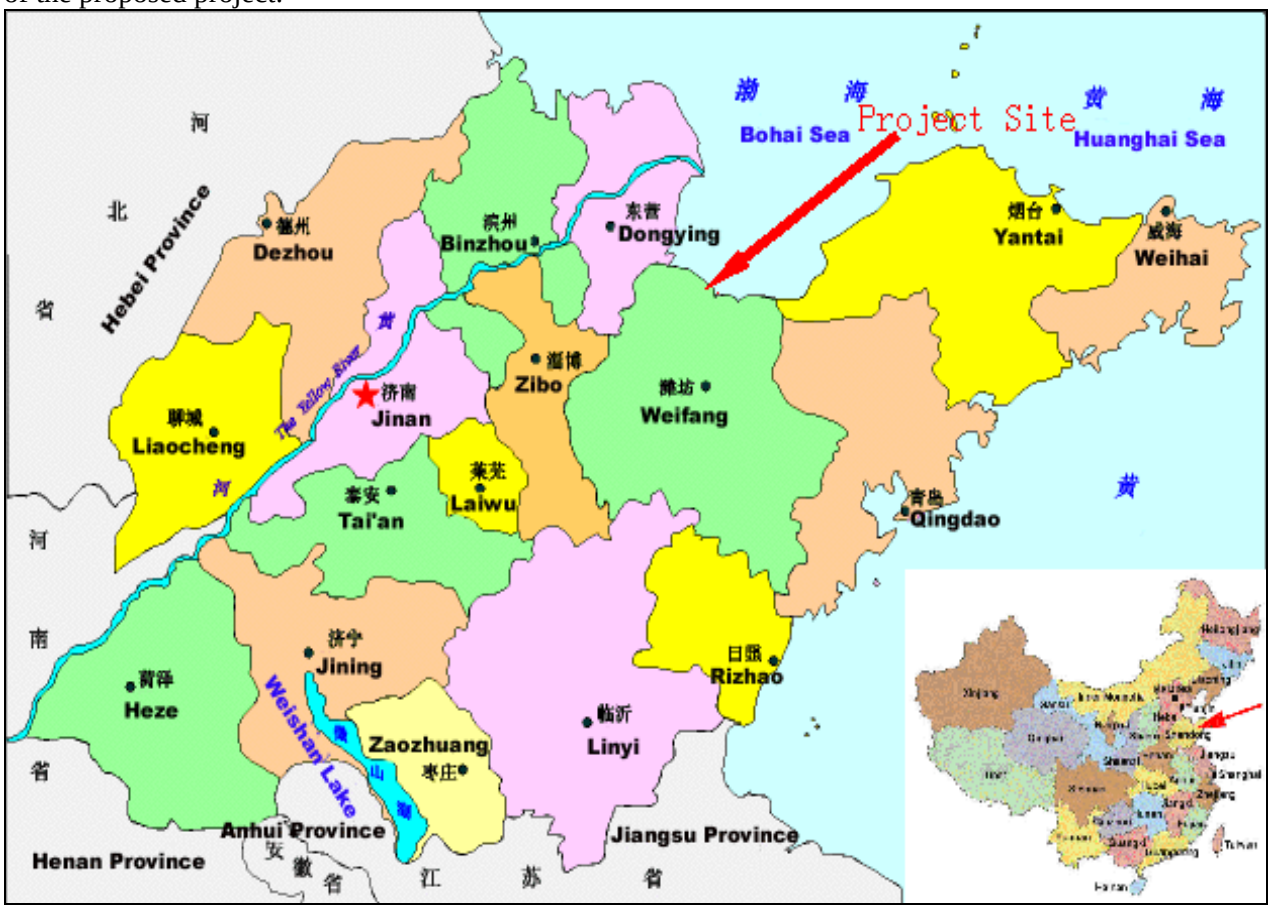

Figure 1: Location of Shandong Province in China

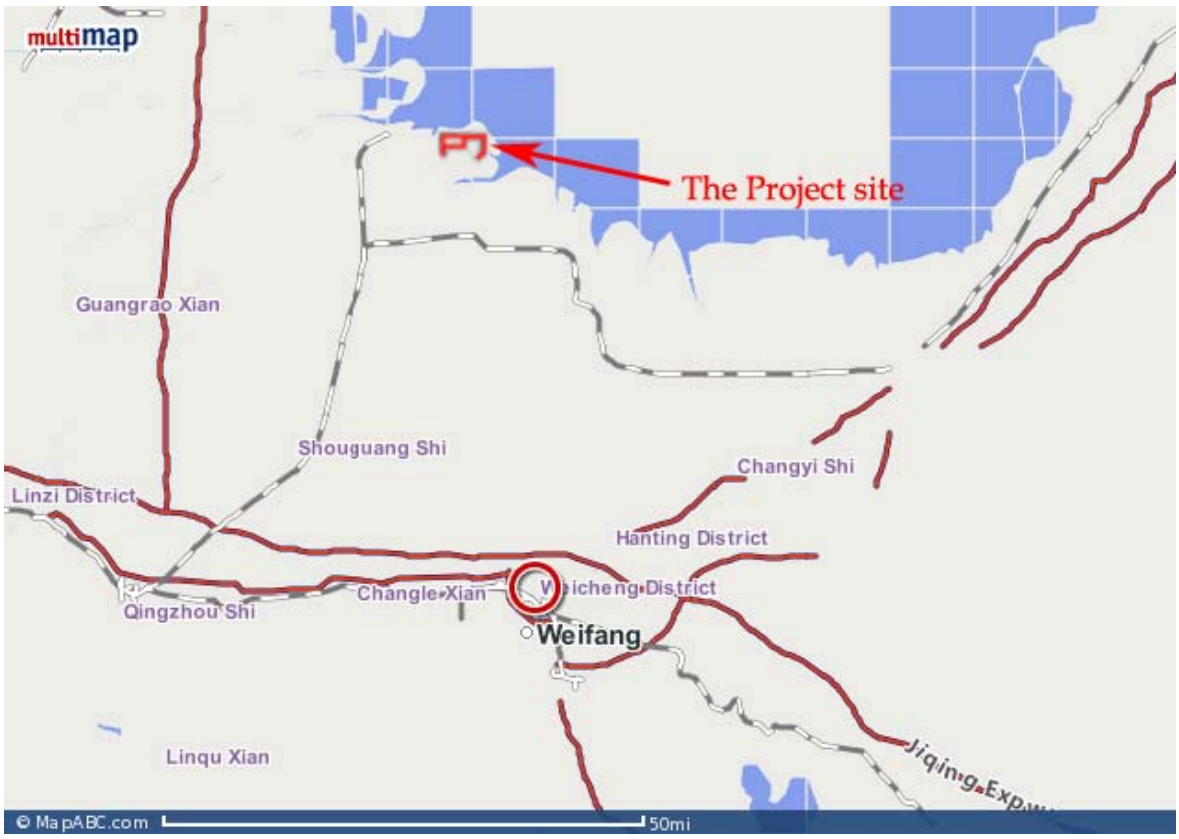

Figure 2: Location of the proposed project site

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

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The proposed project falls into:
Sectoral Scope Number: 1. Energy Industry (renewable sources)

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

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The proposed project is a grid connected wind farm with total installed capacity of 49.5MW (33×1500kW), which will supply 96.4788GWh electricity to NCPG annually 33 wind turbines with rated capacity of 1500kW each will be installed according to the proper design based on local climate and geographical condition. The height of the turbine hub is 80m, and the turbines are to be distributed with row spacing of 540m and column spacing of 500m. The specific parameters of the wind turbine sourced from the Feasibility Study Report (FSR) are as follows:

Table 1: The specific parameters of the turbine

Total installed capacity	49.5MW
Rated capacity per turbine	1500KW
No.of blades	3
Diameter	77m
Cut in wind speed	4.0m/s
Cut out wind speed	25m/s

Nominal out put at velocity	12m/s
Rated output voltage	690V
No. of turbines	33
Equivalent annual operating hours	1949.1h
Annual net on-grid electricity supplied to NCPG	96.4788GWh
Load factor	22.25%

According to the turbine layout in the FSR, each turbine will be equipped with one transformer. The construction will also include a 35kV/110kV step-up substation at the site, which connects the proposed project to another step-up substation via a 22km double-circuit 110kV transmission line, and then the power produced by the wind farm can be transmitted to the SGPG, which is an integral part of NCPG. Therefore the proposed project can replace electricity generated from fossil fuel fired power plant connected to the NCPG and reduce GHG emissions. The wind turbines and transmission facility could be monitored and controlled by onsite central control room and the net electricity delivered to the grid will be measured by electronic meters with acceptable accuracy.

All the technologies of project activity don't involve technology transfer. All the equipments are made by domestic manufactures.

※ Additional information about the on-grid electricity supply of 96.4788GWh.

For the annual theoretical power generation:

In the chapter 2 (Wind resource) and the chapter 6.4 of the FSR, it has found that the annual theoretical power generation is based on 30-year wind data provided by the local meteorological stations and 7-months actual detection data by anemometer towers in project location. Those data used to calculate the annual theoretical power generation is from the long-term assessment on wind resource and the calculation method is scientific and widely used in wind power projects in China. Therefore, the annual theoretical power generation is appropriate. According to the FSR, the annual theoretical power generation is at 143.977GWh.

For the annual net on-grid electricity supply:

As the approved FSR[2], the calculation process of the total loss factor of the proposed project has been listed as follows:

1-(1-Climate loss)×turbine efficiency×power curve efficiency×(1-wake loss)×(1-rotor blade soiling loss)×(1-control and turbulence loss)×(1-transmission line loss and own consumption) =1-(1-6.84%)×95%×95%×(1-7%)×(1-5%)×(1-3%)×(1-7%)=32.99%

According to the loss factor issued by the NDRC[3], the value of the discount coefficient for the proposed project and the total loss factor is reasonable.

In conclusion, the original data used to calculate the annual net on-grid power generation is from the exact assessment on wind resource

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And as a result the on-grid electricity supply is: 143.977 GWh×(1-32.99%)=96.4788 GWh.

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

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[2] Data sources: Page66-67 in FSR.

[3] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2278.pdf

This project chooses a renewable crediting period (renewable twice). The proposed project is estimated to generate emission reductions of 101,765 tCO_2e annually and 712,355 tCO_2e during the first crediting period, which is calculated as follows:

Years	Annual estimation of emission reductions in tonnes of CO_2 e
01/04/2010~31/03/2011	101,765
01/04/2011~31/03/2012	101,765
01/04/2012~31/03/2013	101,765
01/04/2013~31/03/2014	101,765
01/04/2014~31/03/2015	101,765
01/04/2015~31/03/2016	101,765
01/04/2016~31/03/2017	101,765
Total estimated reductions (tonnes of CO_2e)	712,355
Total number of crediting years	7
Annual average of estimated reductions over the crediting period (tonnes of CO_2e)	101,765

A.4.5. Public funding of the project activity:

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No public funding is provided 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:

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The proposed project applies ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002/ Version 09, Sectoral Scope: 01, EB45); and Tool for demonstration and assessment of additionality (Version 05.2); Tool to calculate emission factor for an electricity system (version 01.1) Please refer to UNFCCC website for the methodologies mentioned above:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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This proposed project is a gird-connected renewable power generation project activity which means all the applicability criteria stated in methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation.

The application of ACM0002 for the proposed project is justified as:

- The proposed project involves electricity capacity addition from wind sources;
- The proposed project is a wind farm to be constructed not involving an on-site switch from fossil fuels to a renewable energy resource;
- The geographic and system boundaries for NCPG can be clearly identified and information on the characteristics of the grid is available.

Therefore, the approved methodology ACM0002 is applicable to the proposed project.

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

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

Source		Gas	Included ?	Justification / Explanation
Baseline	CO_2 emission from electricity generation in NCPG power plants that is displaced due to the project activity	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	CO_2 emission from the project activity	CO_2	No	Zero-emissions grid-connected electricity generation from renewable energy.
		CH_4	No	
		N_2O	No	
	CO_2 emission from the backup power generation	CO_2	No	The backup power equipment isn't involved in the project activity on-site. And the electricity purchased from the Grid has been subtracted for the emission reduction calculation.*
		CH_4	No	
		N_2O	No	

(*Note: The proposed project generates electricity by utilizing the wind resources, a clean and zero-emission energy, and it doesn't involve any fossil fuel fired backup power generation on-site, and the electricity consumed by the proposed project is purchased from the SGPG which is deemed as $EG_{in,y}$. However, for the emission reduction is calculated by the $EG_y=EG_{out,y}-EG_{in,y}$. Thus there will be no GHG emission involved in the proposed project activity.)

Spatial boundary: The proposed project is connected to NCPG, which will substitute equivalent amount of electricity by the power mix of NCPG. Therefore, the proposed project boundary can be identified as NCPG and the proposed project site. The spatial scope of the proposed project boundary covers the proposed project site and all power plants connected physically into NCPG. According to newly published information by the China DNA relating to the division of the regional power grids[4], NCPG covers Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia, and Shandong. Therefore, according to ACM0002 the proposed project boundary includes the proposed project activity and all power plants connected to NCPG. Moreover, NCPG is also defined as a regional grid according to the "Explain of confirming baseline emission factors of regional power grid in China"[5] issued by China's DNA. Also, the geographic boundary of the NCPG is clear. Therefore, NCPG is considered as the electricity system for the proposed project for determining the build margin (BM) and operating margin (OM) emission factors.

The proposed project boundary included is shown in the Figure 3 below:

[4] *Notification on Determining Baseline Emission Factors of China Power Grid* issued by China's DNA on 18th Jul, 2008 on http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3239

[5] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081230102527637.pdf

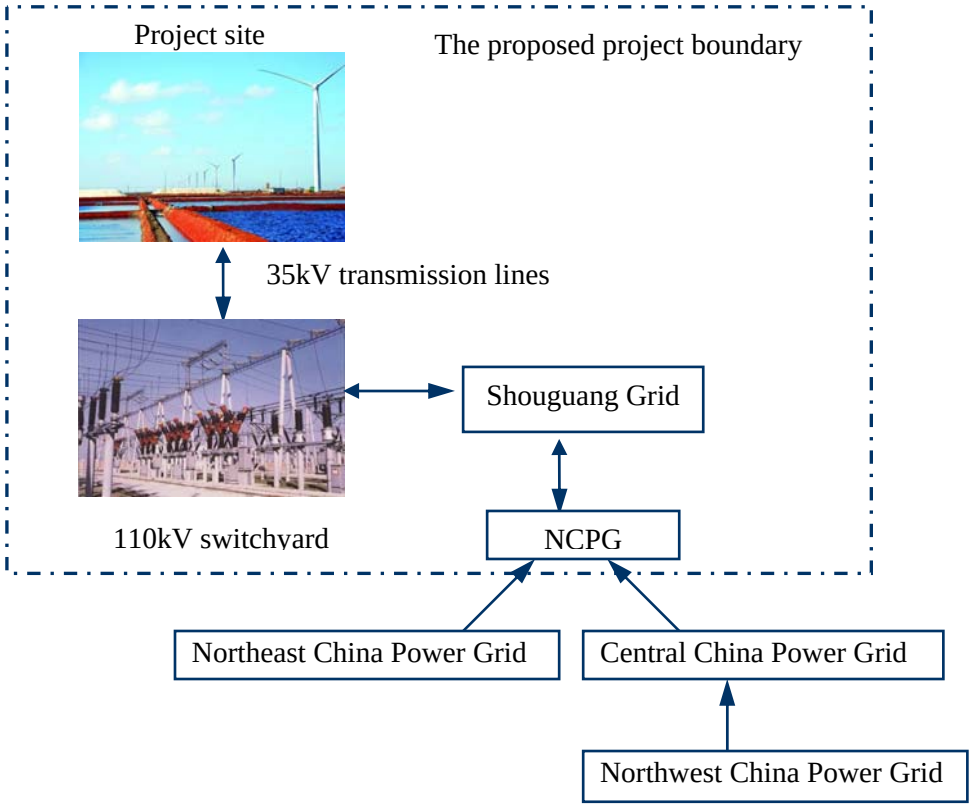

Figure 3: Structure of the proposed project boundary

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

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According to the description in the approved baseline methodology ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario 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) calculated described in the "Tool to calculate the emission factor for an electricity system".

According to the Tool, if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. The electricity generated by the proposed project will be sold to NCPG according to the delineation which is published by the Chinese DNA, So NCPG is considered as the "connected electricity system", which is defined as the "project boundary" of the proposed project. Therefore, being a project with the boundary of NCPG that does not modify or retrofit an existing electricity generation facility, the baseline scenario of the proposed project can be identified as the following:

Electricity delivered to the grid by the proposed project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within the NCPG, as reflected in the combined margin (CM) calculated described in section B6.

The analysis and description in B.5 and B.6 will support the baseline scenario shown above.

B.5. Description of how the anthropogenic emission 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）:

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Activity to achieve CDM

Table 2: Milestones of the Project

Time	Implementation of the Project	Activities to achieve CDM
10/2005	EIA finished;	
05/12/2005	EIA approved;	
04/2006	FSR finished;	CDM development suggested in the FSR;
08/09/2006	Project approved;	
23/10/2006		Board resolution adopted to develop the proposed project as CDM project activity by the former project owner;
15/12/2006		CDM Consulting Agreement signed;
25/05/2007		Project-site investigated by CER buyer;
02/08/2007		Memo of Understanding (MOU) signed between the former project owner and the CER buyer;
22/10/2007	The project development right transferred;	
11/2007	Assessment report on the FSR of the proposed Project released;	
20/12/2007		Original LoA issued by NDRC to former Project owner;
07/01/2008		Board resolution made to continuously develop as CDM project by the new project owner;
16/01/2008	The Purchase Contracts for wind towers signed;	
09/04/2008	The Purchase Contract for wind turbine signed;	
15/04/2007	Construction activities began;	
18/06/2008		Related CDM training started;
10/2008		Negotiation between the current project owner and CER buyer started;
12/2008	The proposed project construction finished;	
18/02/2009		ERPA signed;
04/03/2009		Starting date of GSP of the CDM-PDD on UNFCCC;
12/05/2009		On-site interview by DOE;
03/09/2009		Approval note on change of the Project Owner and LoA issued;

In 10/2005 and 04/2006 the EIA and FSR were finished separately, and then corresponding approvals were acquired respectively on 05/12/2005 and 08/09/2006.

In the FSR, a negative conclusion on investment analysis was made, so further financial incentives must be acquired to make the proposed project feasible and the emission reduction revenue from CDM is suggested to be a feasible solution.

Based on the above conclusion, the former proposed project owner held a board meeting on 23/10/2006 and determined to develop the proposed project as a CDM activity. All the attendants reached an agreement that the company should accelerate the research procedure of Kyoto Protocol in order to master the CDM operational procedures and rules to develop the proposed project as a CDM project. The CDM consulting agreement was signed on 15/12/2006 between the proposed project owner and the CDM Project Entity, Beijing Changjiang River International Holding. On 25/05/2007 the buyer made an on-site visit of the proposed project, and a MOU was signed on 02/08/2007.

However, due to the incapability of the former project owner on the finance and technology, the project ownership has been transformed. And a new separate entity has taken over this proposed project under the consideration of their extensive experience and skilful technology on wind farm construction. They decided to continuously develop this project as CDM activity based on the former project owner's decision as well as an assessment report organized by the exports of the designing institute on 11/2007 and held a board resolution on 07/01/2008.

While developing the project as a CDM project, the project's other works also went on simultaneously. On 16/01/2008 and 09/04/2008, two main equipment purchase contracts for wind tower and turbine were signed, and then project construction commencement was signed on 15/04/2008.

In the meantime of the construction, there were also some CDM actions implemented. On 18/06/2008, a systematic CDM training has been held to further improve and deepen the CDM knowledge and the relevant operation etc. And a negotiation between the current project owner and CER buyer started from the 10/2008, and finally reached an agreement between them on 18/02/2009. Later the order for validation services was signed with the DOE TUEV-Rheinland, and the PDD started one month GSP of CDM-PDD on UNFCCC on 04/03/2009. Then, the TUEV-Rheinland performed on site validation on 12/05/2009.

And on 03/09/2009, an approval note on change of the Project Owner of the proposed project together with the LoA by the Department of Climate Change of NDRC was issued to indicate the project owner change.

The following is going to demonstrate the additionality of the proposed project according to the latest version of the "Tool for the demonstration and assessment of additionality" (Version 05.2) **agreed by the Executive Board.**

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

The step is to define realistic and credible alternatives to the proposed project activities that can be (part of) the baseline scenario through the following steps:

Sub-step 1a: Define alternatives to the project activities:
In the absence of the proposed project, the proposed alternatives would be as the following:

1. Construction of a power plant using other renewable power sources with equivalent output;
2. Construction of a fossil fuel-fired power plant with equivalent amount of installed capacity or annual electricity output;
3. The proposed project activity not taken as a CDM project activity;
4. Provision of equivalent amount of annual power output by the NCPG which the proposed project connected with.

For alternative 1, the proposed project is located in Shandong Province, where is no economically exploitable hydro resource on-site or around the project site[6], thus it is impossible to build a hydropower station with equivalent annual power generation in local place. And the renewable energy of solar PV, geothermal and biomass are limited by the status of the technological advancement and high investment costs[7], which are also far from being economically attractive. Since there is no economically exploitable hydro or biomass resources and etc with an equivalent scale within the area of the proposed project, this alternative 1 is not feasible.

Sub-step 1b: Consistency with mandatory laws and regulation:
For Alternative 2, According to China Power Regulations[8], coal-fired power plants of 135MW or below, if without special permission, are prohibited for construction in the areas covered by large grids and the installation of fossil fuel-fired power unites less than 100MW is under tight control. The annual electricity generation of the wind farm is greatly affected by the local wind resource. Thus, annual operational hours for a fuel-fired power plant are greater than that of a wind farm. Therefore, under the equivalent amount of installed capacity of 49.5MW, the annual power generation of thermal power plants should be much more than that of a wind farm. In other words, if the same annual power generation of 96.48GWh, the installed capacity of a fossil fuel-fired plant power plant should be much lower than that of a wind farm. From this point, option 2 is not a realistic and credible alternative to the proposed project.

For Alternatively 3, According to the Step 2 Investment analysis in Section B.5, this alternative 3 is not financially attractive, which is also faces with many barriers influencing its implementation. Thus, this alternative is not a feasible baseline alternative.

For Alternative 4, “Provision of equivalent amount of annual power output by the NCPG which the proposed project is connected with” is in accordance with the regulations and policies that are currently governing the Chinese power market and economically feasible.

In conclusion, alternative 4 is the only realistic, credible baseline scenario of the proposed project that is in compliance with mandatory legislation and regulations taking in to account the enforcement in the region.

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[6] http://www.nwqc.gov.cn/xwzy/xwzyshow.asp?id=1640

[7] http://ac.agri.gov.cn/ac/ViewContent.do?id=4affaa20110219f101116d279548047d&year=2007&month=3&right=!ENCODEtkc1vlOItllg1Oe

[8] Notice on Strictly Prohibiting the Illegal Installation of Coal-fired Generators with the Capacity of 135MW or Below issued by the General Office of the State Council (GuoBanMingDian decree No. 2002-6) http://www.gov.cn/gongbao/content/2002/content_61480.htm

Step 2: Investment Analysis

This section is used to analyze whether the proposed activity is not:

(1) The most economically or financially attractive; or

(2) Economical or financially feasible, without the additional revenue/funding from CDM revenues.

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

Sub-step 2a: Determine appropriate analysis method

According to the" Tool for the demonstration and assessment of additionality", there are three options for investment analysis as following:

Option I: Simply cost analysis;

Option II: Investment comparison analysis;

Option III: Benchmark analysis.

The simply cost analysis (option I) is not appropriate because the proposed project will get the revenue not only from the CDM but also from electricity sales. The investment comparison analysis is not applicable to the proposed project because the alternative of the proposed project "equivalent electricity generated by NCPG" is not the alternative investment project. Hence, Option III-Apply benchmark analysis is chosen to demonstrate and asses the additionality, since the data on the total investment IRR of Chinese power industry is available.

Sub-step 2b. Option III-Apply benchmark Analysis

According to the Clause 1.11 in page 2 of the "*Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*"[9] by former State Power Corporation of China in 2002, the financial benchmark of total investment Internal rate of return (IRR) for Chinese electricity industry is 8%, which has been used widely in feasibility of new power plants, including wind power projects in China. On the basis of this benchmark, calculation and comparison of financial indicators are carried out in sub-step 2c.

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

(1) Basic parameters for financial analysis of the proposed project are as follows:

The critical techno-economic parameters and assumptions of the proposed project from Approved FSR for calculation of IRR are presented below:

Table 3: The data for the calculation of IRR

No.	Item	Value	Data source
1	Install capacity	49.5MW	Approved FSR
2	Annual net on-grid power generation	96.4788GWh	Approved FSR
3	Project lifetime	21 years and 3 months (15 months construction and 20years for operation)	Approved FSR
4	Total investment	RMB 559.07 million	Approved FSR
5	Loan period	12year	Approved FSR
6	Average annual O&M cost	around RMB 12.33million Yuan	Approved FSR
7	Bus-bar tariff	RMB 0.76yuan/kWh(with VAT)	Approved FSR
8	VAT tax	8.5%	Notice of VAT Policy

[9] State Power Corporation of China. Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects. Beijing: China Electric Power Press, 2003

			Regarding Products Using Certain Synthesized Resources and Other Products Caishui [2001] No. 198[10]
9	Income tax	25%	In accordance with the Adjustment of New Income Tax announced on 16/03/2007.
10	City maintenance and Construction tax[11]	5%	Approved FSR
11	Education surcharges[12]	3%	Approved FSR
12	Residual rate[13]	5%	Approved FSR
13	Depreciable life/Rate	15years/6.33%	Approved FSR

(2) **Calculation and comparison of FIRR of the proposed project activity and the financial benchmark**

In accordance with Option III, if the financial indicator (such as IRR) of the proposed project is less than the benchmark, the proposed project is not attractive.

Based on the data above, the IRR without CDM sales revenue are shown in the following table. It is clear that without CDM sales revenue, the FIRR of the proposed project is only 6.97%, lower than the benchmark of 8%. Therefore, the proposed project is not financially attractive.

However, the extra income from CDM will improve the economic competitiveness of the proposed project if it is registered as a CDM project activity. The FIRR (including expected CDM revenue) will be increased to 9.25% which is higher than the benchmark of 8%, making the proposed project financially feasible.

	Project FIRR
Without CDM revenue	6.97%
With CDM revenue	9.25%

Sub-step 2d: Sensitivity analysis

In accordance with the "Tool for demonstration and assessment of additionality (Version 05.2)", the objective of sensitivity analysis is to examine whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumption. The investment analysis provides a valid argument in favour of additionality only if consistently supports (for a realistic range of

[10] http://www.miit.gov.cn/n11293472/n11505629/n11506364/n11513661/n11928080/n11928125/12028842.html

[11] The value is in line with the "Interim Regulations on City Maintenance and Construction Tax of the People's Republic of China" (promulgated on Document [1985] No. 19 of the State Council on Feb. 8, 1985).

[12] The value is in line with the document Decision of the State Council on "Amending the Interim Provisions on the Collection of Educational Surcharges" (promulgated on Document Order of the State Council No. 448 on August 20, 2005)

[13] The value is in line with the relevant national tax regulation i.e. Guo Shui Han [2005] No. 883

assumptions) the conclusion that the project activity is unlikely to be the most financially attractive or is unlikely to be least financially attractive.

According to "Guidance on the Assessment of Investment Analysis (Version 03)" issued by EB 51 Report[14], only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. Therefore, four parameters of the **bus-bar tariff, total investment, annual net on-grid power generation** and **annual O&M cost** were identified as the main variable factors for the proposed project. And fluctuation range of ±10% for sensitive analysis of financial attractiveness is also in accordance with "Guidance on the Assessment of Investment Analysis". Their impacts on project IRR were analyzed in this step.

For detailed results of sensitive analysis of the four indicators, please see Table 4.

Table 4: Sensitivity analysis of the critical assumptions of the proposed project

Parameter / Range	-10.00%	-7.50%	-5.00%	-2.50%	0%	2.50%	5.00%	7.50%	10.00%
Bus-bar tariff	5.71%	6.03%	6.35%	6.66%	6.97%	7.27%	7.57%	7.87%	8.16%
Total Investment	8.23%	7.89%	7.56%	7.25%	6.97%	6.68%	6.40%	6.13%	5.86%
Annual net on-grid power generation	5.74%	6.05%	6.36%	6.67%	6.97%	7.27%	7.56%	7.85%	8.14%
Annual O&M Cost	7.18%	7.13%	7.07%	7.02%	6.97%	6.92%	6.86%	6.81%	6.76%

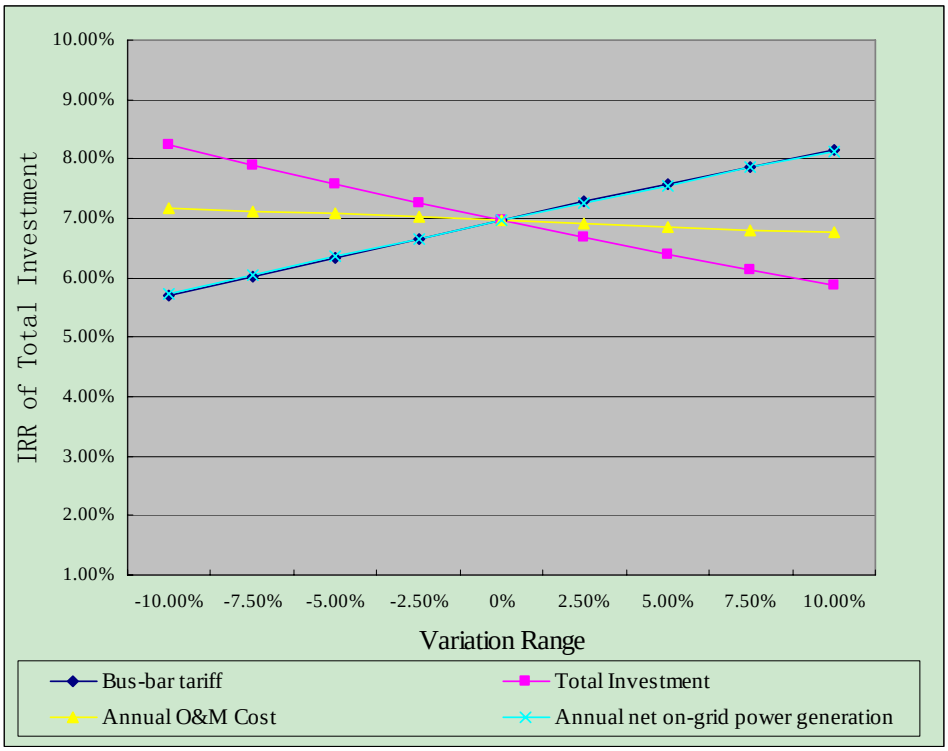

Figure 4: Sensitivity analysis of critical parameters

[14] http://cdm.unfccc.int/EB/041/eb41_repan45.pdf

Table 4 and Figure 4 shows within a reasonable range of fluctuation by the four parameters, the IRR of total investment of the proposed project is still lower than the benchmark 8%, which obviously demonstrates that the proposed project is not financially attractive.

Moreover, the following Table 5 shows the four parameters' fluctuation to reach the benchmark IRR 8% (Excluding CERs Revenue):

Table 5: Variation of financial parameters to reach the benchmark

	Benchmark	Percentage variation to the Benchmark
Bus-bar tariff	8%	Increase 8.6%
Total investment		Decrease 7.8%
Annual net on-grid power generation		Increase 8.6%
Annual O&M cost		Decrease 38%

From the Table 5, the expected power tariff increase by 8.6% which equals to 0.825yuan/kWh, the IRR of proposed project will exceed the benchmark. However, this increment is impossible. First of all, there were not any governmental documents about the bus-bar tariff of wind projects in Shandong Province before the investment decision. According to the available latest guiding bus-bar tariff approvals issued by Shandong Province Price Bureau in January 2007[15] before the project starting date, the approved tariffs of 0.76yuan/kWh which is same with the tariff of the proposed project was adopted in the IRR calculation. Moreover, from July 2008, NDRC issued the tariff notification for wind power projects in Shandong Province (NDRC [2008] 1876)[16]. In this document, the tariff of wind power projects in Shandong province began to be unified as 0.61yuan/kWh. In March 2009, the tariff of the wind power projects in Shandong province including this proposed project was unified as 0.61yuan/kWh again[17]. Therefore, it is unlikely that the grid price will increase and as a result, it is not possible to improve the IRR through an increase in the grid price.

Then, if 7.8% of the total investment could be saved, the IRR of the proposed project could reach the benchmark IRR. However, this assumption is unrealistic as the prices, including equipments and commodities, also the labour costs have been increasing in recent years[18]; a significant reduction of the investment is improbable. Moreover, according to a brief statistical calculation on the main contracts of the wind turbine set and the wind tower equipment, the actual cost has already been 9.43% higher than the relevant designed data in the FSR. Therefore, a significant reduction in the level of investment is particularly impossible.

If the power delivered to the grid increases by 8.6%, the IRR of total investment will reach the benchmark of 8%. The power generation of the proposed project depends on the average wind speed at the project site for a specific wind turbine. However, the annual net on-grid power generation in the FSR is calculated on the basis of wind assessment records from 1975 to 2004 on the Shouguang Meteorological Station, it mentioned that the annual average wind speed of the local place tends to decrease over the past years[19]. Therefore, the probability for an increase of the annual net on-grid power generation of 8.6% will

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[15] http://www.sdwj.gov.cn/Newsdisplay.jsp?id=1185f03b974[cc357d]-6b36

http://www.sdwj.gov.cn/Newsdisplay.jsp?id=1185f03b974[98d146]-6b92

[16] http://bgt.ndrc.gov.cn/zcfb/W020080813588686131541.pdf

[17] http://www.sdwj.gov.cn/Newsdisplay.jsp?id=2114a563b4%5B134ff95%5D-8000

[18] Relevant proof can refer to the website: http://www.stats.gov.cn/tjsj/ndsj/2008/html/I0802e.htm

[19] Refer to the page 21 in the Chapter 2 of the FSR.

be low

The O&M cost mainly include staff charges (wages, welfare), maintenance and other costs, insurance for fixed assets, which is an insensitive factor and strictly calculated according to the relevant national regulations from the approved FSR. But the staff charges, as a main component of the O&M cost, is the only unstable part which is easily influenced by the national development. And according to the information published by the National Bureau of Statistic Yearbook 2008, it indicates that the enterprises' wage has been on the rising tendency[20]. Therefore, it is unlikely for the annual O&M cost to decrease more than 38%.

Based on the investment analysis above, it shows that the proposed project is not financially attractive. Without CDM support, the proposed project would unlikely occur.

Step 3: Barrier analysis
Not applied. Since it is demonstrated in Step 2 above that the proposed CDM project activity is not financially attractive, we proceed to step 4.

Step 4 Common Practice Analysis

Sub-step 4a.Analyze other activities similar to the proposed project activity
In the additionality tool version 05.2, definition of similarity is outlined as "Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.". In accordance with this guidance, the detailed analysis steps are shown as following.

Firstly: Choose the similar area
The common practice analysis chooses Shandong province as the physical boundary.
The total wind energy resources in Shandong Province are about 67 million kW per year[21].In Shandong Province, the wind power are located in the coastal areas so the wind power generation projects are different from those other inland provinces or regions as Hebei, Inner Mongolia, Shanxi, Beijing of the NCPG. In China, the provincial government comes out the related policies for itself based on laws, regulations and distinctive conditions, which include financial, tax and price aspects, so does Shandong Province. In addition, the bus-bar tariff of a wind power project should also be approved by provincial price department. Therefore, Shandong Province is chosen as the boundary. Therefore, the data resource is taken from the report on "Statistics of Wind Farm Installation in China by 2007" by Shi Pengfei[22], the vice chairman of Chinese Wind Energy Association. And this statistics is regarded as the authoritative study on wind farms in China and the data regularly used by government, academic study and industry. Thus, the projects in Shandong Province from this report are chosen for the common practice.

Secondly: Choose similar construction year

[20] Data resources: http://www.stats.gov.cn/tjsj/ndsj/2008/html/E0423E.HTM

[21] http://www.newenergy.org.cn/html/0068/2006829_11616.html

22 Data source for "Statistics of Wind Farm Installation in China by 2007" is China Wind Energy Association http://www.cwea.org.cn/upload/20080324.pdf

According to the Notice on Electric Power Sector Reform Program issued on 10th February 2002 by the State Council, a significant electric power sector reform was undertaken. The objective of this power sector reform is to establish a more commercialized power market in China. Power project investment has to be under a more commercialized condition and considers project investment return more seriously. Since market condition for wind power project development changes much since 2002, this common practice analysis starts from 2002.

Thirdly: Choose similar projects of large scale

The installed capacity of activities should be more than 15MW, projects less than 15MW belong to small-scale projects[23].

Based on above principles, the similar projects are defined as large scale wind power projects in Shandong Province after 2002 as Table 6 shown below:

Table 6: The similar activities in Shandong Province

Project Name	Project Date (M/Y)	Total Capacity	Note
Huaneng Changdao Liancheng	12/2005	27.2MW	Registered as CDM projects (registration reference No.1090)
Jimo Fengshan	2000-2003	15.6MW	This project was part of the Chengfeng plan, established by the Chinese government offering special subsidies.
Qixia Tangshanpeng	11/2005	21.75MW (7.5MW+14.25MW)	Registered as CDM projects (registration reference No. 1019)
Rongcheng Dongchudao	12/2005	15MW	Registered as CDM projects (see (registration reference No. 1008)
Weihai Rongcheng Ganxizhen	12/2006	69MW(25.5MW+43.5MW)	Registered as CDM projects (registration reference No. 1128)
Rongcheng Chengshan Sancun	03/2007	48.75MW	Applying CDM http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2007.doc (Project 304)
Laizhou Datang Tushan	12/2007	48MW	Registered as CDM projects (registration reference No. 2530)
Laizhou Luneng Diaolongzui	12/2007	17.5MW	Registered as CDM projects (registration reference No. 1010)
Laizhou houbapu	12/2007	31.5MW	Applying CDM http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2007.doc (project 1115)

[23] Please refer to the Item 6(c) in the Decision 17/CP.7 <Modalities and procedures for a clean development mechanism as defined in Article 12 of the Kyoto Protocol>, relevant website: http://unfccc.int/files/meetings/workshops/other_meetings/application/pdf/17cp7.pdf

Sub-step 4b. Discuss any similar options that are occurring
Wind farms in Shandong Province with the installed capacity larger than 15MW are shown in the Table 7 above, from which one can see that apart from Jimo Fengshan wind farm, all the others are registered as CDM projects or are applying to be registered as CDM activity.

As for the project of Jimo Fengshan wind farm, it is a project as part of government's Chengfeng Plan[24], and constructed with special subsidies offered by the Chinese Government, so Jimo Fengshan wind farm enjoys the advantages such as technology and finance and so on and is different from the proposed project, and should be excluded.

Therefore, the proposed project is not common and the existence of the above project cannot bring any influence on the additionality of the proposed project.

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

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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According to Tool to calculate emission factor for an electricity system (version 01.1), it is required to estimate the Operating Margin (OM) and Build Margin (BM) emission factor ex-ante, and through weighted average of OM and BM, the Combined Margin baseline emission factor of the NCPG can be obtained and then the emission reductions from CDM project activity can be estimated based on the following 3 steps:

Step l - Calculation of the Operating Margin Emission Factor (OM)
Step 2 - Calculation of the Build Margin Emission Factor (BM)
Step 3 - Calculation of the Combined Emission Factor (CM)

Step 1 - Calculation of the Operating Margin Emission Factor ($EF_{OM,y}$)

***Step1 a*- Identify the relevant electric power system**

As the electric power system of the proposed project activity has been identified in section B.3 above, this step can be skipped.

***Step1 b*- Select an operating margin (OM) method**
The ACM0002 provides four options to calculate the operating margin:

(a) Simple OM; or
(b) Simple adjusted OM, or

[24] Information about Chengfeng Plan and Jimo Fengshan Windfarm
http://www.creia.net/html/2008109152258351.html
Jimo Fengshan Windfarm as part of Chengfeng Plan
http://gov.finance.sina.com.cn/zsyz/2006-11-29/94407.html
Jimo windfarm are also called as Qingdao Huawei Wind-Power Generation Project
http://www.stport.net/News/File_/0520060227092108.htm

(c) Dispatch Data Analysis OM, or
(d) Average OM.

For the proposed project activity, because the dispatch data of the NCPG in China is not available to the public, option (c) is not applicable. As low-cost/must-run power sources constitute less than 50% of the NCPG, option (b) is not applicable and option (a) (simple OM) is the only reasonable method among the four options.

Step1 c- **Calculate the OM emission factor according to the selected method**

The Simple OM emission factor ($EF_{OM, simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. The formula of $EF_{OM, simple,y}$ calculation is:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (1)$$

Where:

$EF_{grid,OMsimple,y}$:	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
$FC_{i,y}$:	Amount of fossil fuel type *i* consumed in the proposed project electricity system in year *y* (mass or volume unit);
$NCV_{i,y}$:	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
$EF_{CO2,i,y}$:	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);
EG_y :	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 :	All fossil fuel types combusted in power sources in the proposed project electricity system in year *y*;
y :	The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)

Step1 d- **Identify the cohort of power units to be included in the build margin (BM)**

The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or
(b) 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[25].

In this PDD, the BM ex-ante method is adopted. And because it is very difficult to obtain the data of five most recently built power plants as these data are considered as confidential business information in China, the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently is selected as the sample group *m*. The power plants which are CDM projects are not included in sample group *m*.

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

However, even for those built most recently power plants that comprise 20% of the system generation, it is also difficult to obtain the specific data regarding to fuel consumption and electricity generation additions by each power sources as confidential reason. Considering this situation, the clarifications given by EB for deviation[26] in use of methodology AM0005 and AMS-I.D by several project activities in China are adopted when estimating *BM* emission coefficient.

Thus, the most recent built power plants are calculated as the difference of total installed power capacities in the year 2005 and 2006, respectively, which accounted for 21.75% of the total capacity in 2006. So the calculation by using the data in the years 2005 and 2006 satisfies the requirements of ACM0002.

Step 2. Calculate the Build Margin Emission Factor ($EF_{BM,y}$)

As the generation-weighted average emission factor (tCO_2/MWh) of a sample power plants *m*, using equation:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (2)$$

Where

$EF_{grid,BM,y}$	the build margin CO_2 emission factor in year y (tCO_2/MWh);
$FE_{EL,m,y}$	the CO_2 emission factor of power unit m in year y (tCO_2/MWh);
$EG_{m,y}$	the net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh).

According to ACM0002 and clarifications by EB, the main steps for BM calculation are as following:

Sub-step 1: Calculation of weights of CO_2 emissions by coal-fired, oil-fired and gas-fired plants in total CO_2 emissions of NCPG.

$$\lambda_{coal,\ y} = \frac{\sum_{ieCOAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (3)$$

$$\lambda_{Oil,y} = \frac{\sum_{ieOIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (4)$$

$$\lambda_{Gas,y} = \frac{\sum_{ieGAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (5)$$

Where: is the total amount of fuel i (in a mass or volume unit) c

$F_{i,j,y}$:	the total amount of fuel *i* (in a mass or volume unit) consumed by Province j in NCPG for power generation in year y;
$NCV_{i,y}$:	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or

[26] Http://cdm.unfccc.int/projects/Deviations.

volume unit);

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

This PDD adopts the CO_2 emission weights by coal-fired, oil-fired and gas-fired plants of total CO_2 emission of NCPG in 2006.

Sub-step 2: Calculation of emission factor of thermal power ($EF_{thermal\ power}$) of NCPG.

The $EF_{thermal\ power}$ is calculated as a weighted emission factor as the following formula:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (6)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available in China.

According to the data issued by China DNA[27], the efficiency level of the domestic sub-critical 600 MW coal power unit and the efficiency level of 200 MW of oil and gas power unit are taken as the efficiency levels of the best technology for coal-fired power plants, and oil and gas fired power plants commercially available in China, which are respectively 37.28%, 48.81% and 48.81%.

Sub-step 3: Calculation of Build Margin (BM) emission factor of NCPG.

Finally, weighted average build margin emission factor (EF_BM,y) are calculated by multiplying the $EF_{thermal\ power}$ with the weight of new capacity addition by thermal power of total capacity addition in NCPG.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (7)$$

Where:

CAP_{Total}: the total capacity addition of NCPG between 2005~2006;

$CAP_{Thermal}$: the capacity addition by thermal power of NCPG between 2005~2006.

The method of OM and BM calculation above refer to official website:
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081230102527637.pdf issued by China DNA.

Step 3. Calculate the combined margin (CM) emissions factor

Based on ACM0002, the final step is to calculate the weighted average baseline emission factor of the proposed project as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad (8)$$

Where：

[27] Chinese DNA designates it at http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081231101111351.pdf

$EF_{grid,BM,y}$: Build margin CO_2 emission factor in year *y* (tCO_2/MWh);
$EF_{grid,OM,y}$: Operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
The weights w_{OM} and w_{BM}, by default, are 75% and 25%, respectively, and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above.

Step 4 Calculation of the Emission reduction (ER_y) by the proposed project activity
The proposed project activity will generate greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants. The emission reduction ER_y by the proposed project activity during a given year *y*, according to the Methodology ACM0002, is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (LE_y), as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (9)$$

For this project, because there is no fossil fuel consumption for operation of the back-up power equipment, the proposed project emission is zero. And according to ACM0002, leakage need not be considered. So, the emission reduction is equal to baseline emission BE_y, which is the product of the baseline emissions factor (EF_y) calculated in Step 3, times the annul electricity supplied by the proposed project activity to the grid (EG_y), i.e.:

$$ER_y = BE_y = EG_y \bullet EF_y = (EG_{out,y} - EG_{in,y}) \cdot EF_y \quad (10)$$

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

Data / Parameter:	$F_{i,j,2004\sim2006}$
Data unit:	Ton or m^3
Description:	The total amount of fuel *i* (in a mass or volume unit) consumed by Province j in NCPG for power generation in year 2004, 2005 and 2006.
Source of data used:	China Electric Power Yearbook (2005~2007)
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with the "Tool to calculate the baseline, project and/or leakage emission factor from electricity consumption".
Any comment:	For OM and BM calculation.

Data / Parameter:	$EG_{j\ 2004\sim2006}$
Data unit:	MWh
Description:	The electricity generation by the Province *j* in NCPG in year 2004, 2005 and 2006.
Source of data used:	China Electric Power Yearbook (2005~2007)
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually	The data selected comply with the "Tool to calculate the emission factor for an electricity system".

applied :	
Any comment:	For OM calculation.

Data / Parameter:	NCV i
Data unit:	kj/Kg or kj/m^3
Description:	the net calorific value (energy content) per mass or volume unit of a fuel *i*
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 :	According to "Tool to calculate the emission factor for an electricity system", the national value is used.
Any comment:	For OM and BM calculation.

Data / Parameter:	$EF_{co2,I}$
Data unit:	tC/Tj
Description:	CO_2 emission factor per energy unit of fuel i.
Source of data used:	Table1.3 Default Value of Carbon Content, Page 1.21, Page 1.22 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, when the national value is unavailable, IPCC default is used.
Any comment:	For OM and BM calculation.

Data / Parameter:	Installed Capacity $_{2004, 2005, 2006}$
Data unit:	MW
Description:	The installed capacity of Province j in NCPG in year 2004, 2005 and 2006.
Source of data used:	China Electric Power Yearbook(2005~2007)
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to "Tool to calculate the emission factor for an electricity system", the national value is used.
Any comment:	For BM calculation.

Data / Parameter:	$OXID_i$
Data unit:	
Description:	The oxidation factor of the fuel.
Source of data used:	Table1.4 Default CO_2 Emission Factor For Combustion, Page 1.23, Page 1.24 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas
Value applied:	See Annex 3.
Justification of the choice	This data is based on IPCC default value because the national specific value is

of data or description of measurement methods and procedures actually applied :	unavailable.
Any comment:	

Data / Parameter:	$\eta_{Adv,I}$
Data unit:	%
Description:	The efficiency level of the best technology for each fuel type commercially available in China.
Source of data used:	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081231101111351.pdf
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with "Tool to calculate the emission factor for an electricity system".
Any comment:	For BM calculation.

Data / Parameter:	λ_i
Data unit:	%
Description:	The proportion of emission from different fuel i power plant to the total emissions of NCPG.
Source of data used:	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1888.pdf
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with "Tool to calculate the emission factor for an electricity system".
Any comment:	For BM calculation.

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

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1. $EF_{OM,simple}$ of NCPG

According to the OM calculation of China DNA, the Simple OM emission factor of NCPG is at is 1.1169 tCO_{2e}/MWh (see details in Annex 3).

2. EF_{BM} of NCPG

According to BM calculation of China DNA, based on the formula (6) in B.6.1, the $EF_{thermal\ power}$ of NCPG is at 0.9083 tCO_2/MWh (See details in Annex 3).

The new capacity addition of thermal power in NCPG accounts for 95.64% of total capacity addition between 2005~2006. Thus, based on formula (7) above, the build margin emission factor is calculated as 0.8687 tCO_{2e}/MWh (See details in Annex 3).

3. EF of NCPG

According to equation (8), the baseline combine emission factor =1.1169 × 75%+0.8687 × 25% =1.0548 (tCO_{2e}/MWh).

4. Emission reduction (ER_y) by the proposed project activity

According to formula (10):

$ER_y=BE_y = EG_y \times EF_y = (EG_{out,y} – EG_{in,y}) \times EF_y = 96,478.8 \times 1.0548 = 101,765\ tCO_{2e}$

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

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Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of emission reductions (tCO2e)
01/04/2010~31/03/2011	0	101,765	0	101,765
01/04/2011~31/03/2012	0	101,765	0	101,765
01/04/2012~31/03/2013	0	101,765	0	101,765
01/04/2013~31/03/2014	0	101,765	0	101,765
01/04/2014~31/03/2015	0	101,765	0	101,765
01/04/2015~31/03/2016	0	101,765	0	101,765
01/04/2016~31/03/2017	0	101,765	0	101,765
Total (tCO_{2e})	0	712,355	0	712,355

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

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B.7.1. Data and parameters monitored:

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Data / Parameter:	$EG_{out, y}$
Data unit:	MWh
Description:	Electricity supplied to SGPG within NCPG by the proposed project in the year y
Source of data to be used:	Measured by a bidirectional meter M1;
Value of data applied for the purpose of calculating expected emission reductions in section B.5	In accordance with the FSR, estimation of annual power generation delivered to grid: 96,478.8MWh
Description of measurement methods and procedures to be applied:	the reading of meter M2 will be monitored continuously and recorded monthly, and then cross-checked with the reading of meter M1 installed and owned by the grid company
QA/QC procedures to be applied:	According to national standard, meters will be calibrated periodically. Data measured by meters will be double checked by sales receipt.
Any comment:	-

Data / Parameter:	$EG_{in, y}$
Data unit:	MWh

Description:	Electricity purchased from SGPG within NCPG by the proposed project in the year y
Source of data to be used:	Measured by a bidirectional meter M1;
Value of data applied for the purpose of calculating expected emission reductions in section B.5	In this PDD, electricity purchased from the grid is assumed 0MWh;
Description of measurement methods and procedures to be applied:	the reading of meter M2 will be monitored continuously and recorded monthly, and then cross-checked with the reading of meter M1 installed and owned by the grid company
QA/QC procedures to be applied:	According to national standard, meters will be calibrated periodically. Data measured by meters will be cross checked by sales receipt.
Any comment:	-

B.7.2. Description of the monitoring plan:

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The proposed project owner is responsible for the implementation of this monitoring plan and will be responsible for it. The proposed project owner must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected DOE to verify project performance as part of the verification and certification process. This process also reinforces that CO_2 reductions are real and credible to the buyers of the Certified Emissions Reductions (CERs).

Emission reductions will be achieved through avoided power generation of fossil fuel plant due to the power generated by the proposed project. The $EG_{out,y}$, $EG_{in,y}$ are therefore defined as the key data to monitor and the $EG_y = EG_{out,y} - EG_{in,y}$ is used to calculate the ER_y.

Monitoring Plan

Monitoring tasks must be implemented according to the monitoring plan in order to ensure that the real, measurable and long-term greenhouse gas (GHG) emission reduction for the proposed project is monitored and reported.

1. Responsibility

The monitoring of the emissions reductions will be carried out according to Figure 5 below. The General Manager will hold the overall responsibility for the monitoring process, but as indicated below parts of the process are delegated:

The first step is the measurement of the electrical energy supplied to the grid and reporting of daily operations, which will be carried out by the plant manager.

The project owner will appoint a monitoring officer who will be responsible for verification of the measurement, collection of sales receipts, collection of billing receipts of the power supplied by the grid to the project and the calculation of the emissions reductions. Besides collection of the supporting documentations, the monitoring officer will prepare operational reports of the project activity, recording the daily operation of the project, including operating periods, power generation, power delivered to the grid, equipment defects, etc.

Finally, the monitoring reports will be reviewed by the General Manager.

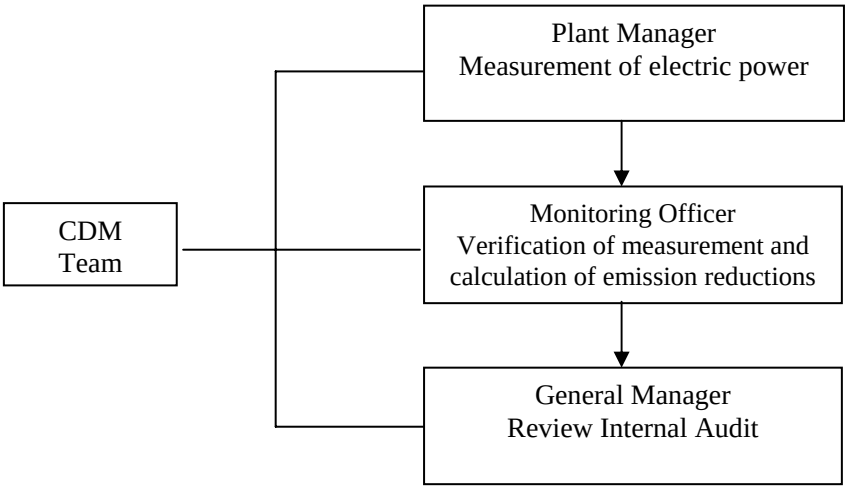

Figure 5: Monitoring and Management Structure

2. Installation of meters

The proposed project is connected to SGPG within NCPG, the power delivered to the grid will be determined and monitored by a bidirectional main meter (M1) installed at the output side of the switching substation. This meter can measure both of the electricity delivered to the grid and the electricity dispatched from the grid, and the net on-grid power supply (EG_y) is defined as ($EG_{out,y}$-$EG_{in,y}$). The main meter will be owned, operated and maintained by the grid company. And a check bidirectional meter (M2) will also be installed on the project site in order to cross check the record data of the main meter. This check meter will be owned, operated and maintained by the project owner. The locations of the meters are shown in Figure 6 as follows.

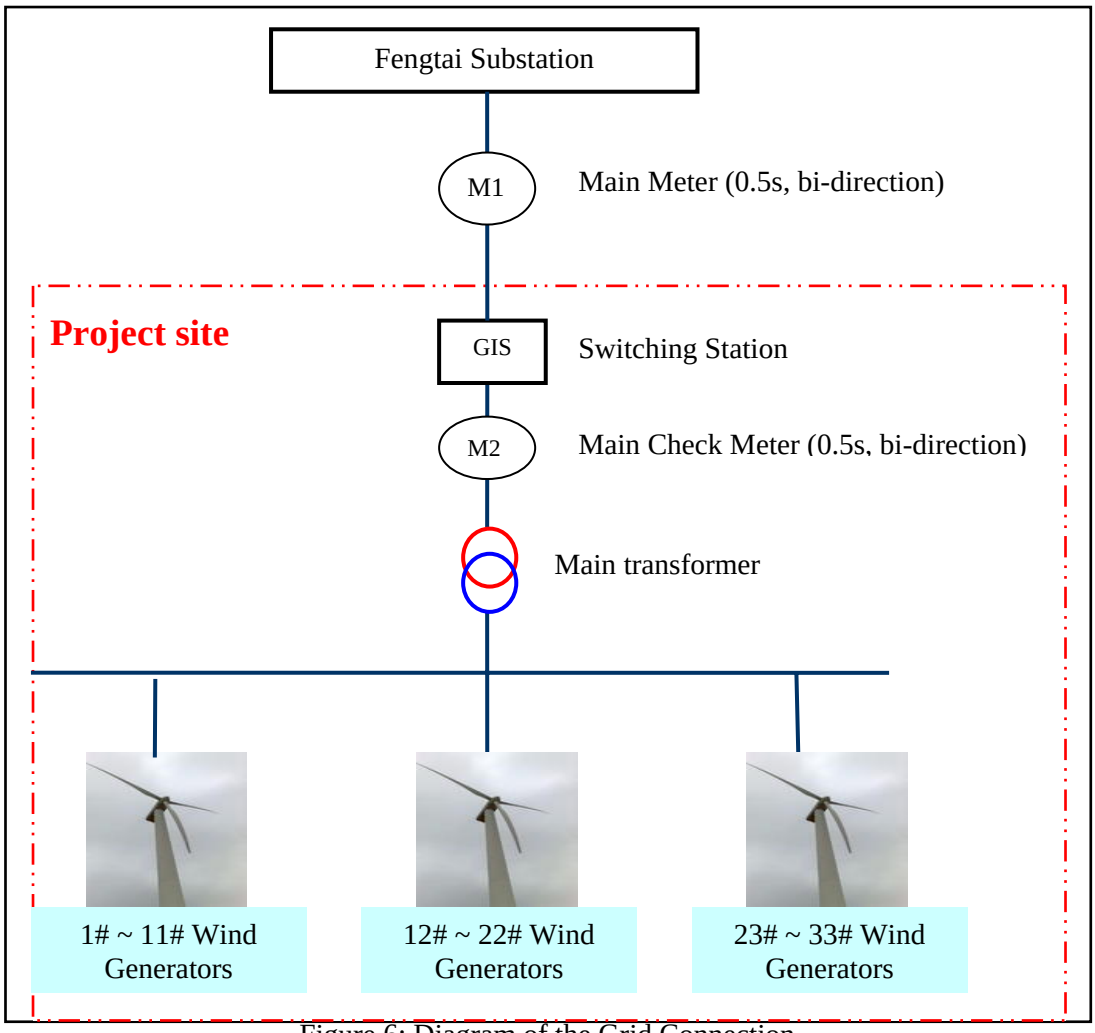

Figure 6: Diagram of the Grid Connection

The metering equipments will be properly configured and checked periodically according to the requirement from Technical Administrative Code of Electric Energy Metering (DL/T448-2000). The metering equipments have been checked by the proposed project owner and Grid Company before operation.

3. Reporting

As indicated in the grid connection diagram, the net electricity (EG_y) can be monitored by the meter M1 in the grid company, which is identified as $EG_y=EG_{out,y}-EG_{in,y}$. The specific steps for data collection and reporting are listed below:

- The main meter recorded on an appointed day each month and the Grid company supplies readings of the main meter to the project owner;
- After checking the reading, the project owner provides the Grid Company with sales receipts, and preserves the copies of the sales receipts for cross check purpose;
- Project owner provides reports, readings and copies of sales receipts to DOE for verification.

If inaccuracy of the reading data from the main meter is malfunctioned, the grid-connected electricity generated by the project should be followed by:

- Reading the backup meter to ensure electricity is supplied to the grid, unless a test by either party reveals it is inaccurate;
- If the backup system is not with acceptable limits of accuracy of 0.5% or is otherwise performing improperly the project owner and Grid Company shall jointly calculate a conservative estimate of power supplied to the grid. In this case, a statement, indicating the background to the damage of the metering equipment, and the assumptions used to estimate net supply to the grid for the days for which no records could be recorded, as well as the estimation of the power supplied to the grid, will be signed by both a representative of the project owner and the representative of the grid company. Then the project owner will furthermore take all efforts to restore normal procedures; and

Moreover, in case of both meters failed, the project owner will not claim emission reductions due to project activity for the duration of the emergency. The project owner will adopt the following two procedures for declaring this emergency period to be over:

- The project owner will ensure that all requirements for monitoring of emission reductions have been re-established;
- The monitoring officer and the general manager will sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

The meter reading will be readily accessible for the DOE. Calibration test records will be maintained for verification.

4. Calibration

The check of the electric meters should be periodically carried out according to the relevant national electric industry standards or regulations. After the check, all meters should be sealed. Both meters shall be jointly inspected and sealed on behalf of the proposed project owner and Grid Company and should not be accessible by the either party except in the presence of the other party or its accredited representatives. And all the meters shall be calibrated specified as follows:

- The metering equipment are calibrated and checked periodically for accuracy;
- All the meters installed shall be tested by a third party within 10 days after:
  (a) Detection of a difference larger than the allowable error in the readings of both meters;
  (b) The repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications.

Calibration is carried out by qualified parties with the records being supplied to the proposed project owner and these records will be retained and maintained both by the proposed project owner and the appointed parties. And the calibration shall ensure sufficient accuracy so that any error resulting from such equipment shall not exceed the allowable error of full-scale rating.

5. Data management system

All data collected as part of monitoring will be archived electronically. All information will be stored by the technology department of the proposed project owner and all the material will have a physical copy for backup. In order to facilitate auditors' reference of relevant literature relating to the proposed project, the proposed project material and monitoring results will be indexed. And all data including calibration records is kept until 2 years after the end of the total credit time of the CDM project.

6. **The Compilation of the Monitoring Report**

The project owner is responsible for compiling the monitoring report, including the data statistics of the $EG_{out,y}$ and $EG_{in,y}$, the calibration of meters and 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)

>>

The baseline study and monitoring plan of the proposed project were completed on 25/02/2009 by the Beijing Changjiang River International Holding.

Ms. Lisa Tu, lisa_tu@crihholding.com, Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.

Mr. Youchun Ge, geyouchun@crihholding.com, Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.

The entity and the persons listed above are not considered as project participants.

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:

>>

16/01/2008 (the date of Wind Tower Equipment Contract signed[28])

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

>>

20 years

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

C.2.1. Renewable crediting period

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

>>

01/04/2010 or the registration date whichever comes later

C.2.1.2. Length of the first crediting period:

>>

7 years 0 months.

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>

Not applicable.

C.2.2.2. Length:

>>

Not applicable.

[28] The equipment purchase contract for wind tower signed on 16/01/2008 is applied for the starting date of the project activity for it represents the earliest date on which the real action begins.

SECTION D. Environmental impacts

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

>>

The Environment Impact Assessment report **(EIA)** was carried out in 2005 by Shandong Provincial Research & Design Institute of Environmental Protection Science. And it was approved on the Environmental Protection Bureau of Shandong province on 5th Dec., 2005.

According to the EIA report, the impacts rising from the proposed project were identified, the mitigation measures were suggested and defined in the following two phases:

Construction Phase

Ecosystem Impacts

Within the proposed project site, there are mainly saline and shore land, most of which are still unfertile and wasted. No vegetation and rare wild animals are identified. Only several sea birds are seen. In addition, no natural reserved area is within the proposed project site. Furthermore, an afforestation activity will be implemented after the construction. The proposed project site is so far from the residential area and the downtown that it will not lead to displace of local population. Thus, the impact on the local ecosystem and local residents will be little.

Soil Erosion

Some land will permanently be taken up or occupied for temporary use. Owing to the strict implementation of the proposed project design, the amount of rock and sand excavated will be reduced as possible. And vehicles on site are compelled to run on the roads instead of running randomly in order to avoid soil erosion. Furthermore, some afforestation projects will be carried out after the construction. Hence, the impact on the soil is limited.

Air pollution

Dust rising from sand and rock excavation, vehicles and machines on site is the main air pollutant during the construction period. Owing to the absence of atmosphere pollution source, low density of population, sound background atmosphere condition and the adopted effective dustproof methods such as watering in accordance with Ambient Air Quality Standard (GB16297-1996) II, the negative impacts mentioned above are limited.

Noise

The running noise of mechanical facilities and the traffic noise are the main source of noises in the construction process. The proposed project owner will control and manage the noise pollution source during the construction in order to be in line with the relevant rules of the Noise Limits on the Border of the Construction Site (GB12348-90) II imposed on the noise during the construction period around the construction site by means of selecting low-noise construction machinery, arranging appropriate working time and vehicle route and strengthening the workers' protection equipments. However, it's sparsely populated near the proposed project site. Thus, the impacts can be neglected.

Wastewater

The water that used in construction phase will be delivered from the urban area. The very little wastewater rising from sand, rock and machines washing will be collected and used for street flushing. For the domestic sewage generated by working personnel, instead of being discharged directly, it will be recycled after disposal in compliance with the Reuse of Urban Recycling Water-Water Quality Standard for Urban Miscellaneous Water Consumption (GB/T 18920-2002). So the impact is not significant.

Solid waste
During the construction period, the solid waste generated from earth-rock excavation will be collected and then be reused for backfilled or land smoothed. The domestic waste will be collected and treated by local sanitation and environment department regularly while the residue will be treated in septic tank. Thus, the impacts are insignificant.

Operation phase
Air pollution
During the operation period, the permanent staffs will use electricity instead of fossil fuel in their daily life, which will not lead to air pollutants discharge. So there will be no adverse impact on the air rising from the proposed project.

Noise
The wind turbines will be the main noise resource during the operation phase. However, it will weaken gradually within distance which is 99 dB (A) at the turbine hub but drops down to only 60 dB (A) at the base of the wind turbines. In addition, wind turbines selected by the proposed project are type of low noise. Furthermore, some strict measures will be carried out to minimize the noise impacts as much as possible including muffler and shock absorber used by on-site worker in accordance with Standard of Environmental Noise of Urban Area (GB3096-1993) I. The residential area is far from the proposed project site. Thus the negative impact is little.

Wastewater
The domestic sewage caused by the permanent staffs is main water pollutant during the operation period. There are only a few working personnel so the domestic sewage is limited. Furthermore, the domestic sewage will be treated in septic tank in compliance with the Reuse of Urban Recycling Water-Water Quality Standard for Urban Miscellaneous Water Consumption (GB/T 18920-2002) before recycled for virescence and watering purpose. Thus, the impact on local area will not be obvious.

Solid waste
During the operation phase, solid waste and domestic waste will be generated by the working staffs. It is planned that the waste glass and steel generated from the vehicles and machines will be collected and sold for recycled and the domestic solid waste will be disposed by local sanitation and environment department. The oiled water caused by the wind turbines will be recycled by local oil factories.
The domestic sewage and residue will be collected and treated in the septic tank before recycled for watering purpose according to The Reuse of Urban Recycling Water-Water Quality Standard for Urban Miscellaneous Water Consumption (GB/T 18920-2002). Hence, the adverse impact is not obvious.

Electromagnetic Field Impact
Impact on Electromagnetic Field (EMF) will be caused by the substation and transmission lines during the operation period. It’s measured that electric field intensity is just 0.3 kV/m 10m away from the transmission lines while the main frequency of the radio field is lower than 10.0 MHz. It’s surveyed that the longer the distance, the weaker the impact on EMF. Therefore, the EMF affects the area that farther

away from wind farm must be weaker. It's surveyed that all the parameters of affected area 20m away the proposed project site can meet the standard of 0.5MHz.
In addition, some measures will be taken to mitigate the negative impacts as possible including set up transmission lines shelter area, design the evacuation system and equipment properly, protect the staffs from the impact on EMF with special clothes, caps and glasses etc. Some regulations have been set up to forbid working staff on site entering the area where EMF is beyond 50μm/cm^2.
Furthermore, the sensitive protection points are not within the affected area. Hence, the impacts on local resident and the staff can be considered insignificant.

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:

>>
The environmental impacts of the proposed project are not considered to be significant due to the mitigation methods referred to above.

SECTION E. Stakeholders' comments

>>

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

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In order to investigate the impacts on the local environment, the former proposed project owner formed a team and spent 15 days on carrying out a specific project survey by distributing questionnaires to local stakeholders on August 2007[29]. During this survey, 50 copies of questionnaire have been distributed, and all of them were received. The recovery ratio is 100%. Among the interviewees, there were 11 of them have educational level of university, 24 of collage, 9 of high school, 5 of technical middle school and 1 of middle school. The average age of them is at 38. The questions regarding the proposed project were mainly as follows:

1. Are you familiar with the proposed project?
2. Do you support the construction of the proposed project?
3. Do you support the development of CDM project?
4. What's the impact on your daily life from the proposed project?
5. What's the impact on local economic development from the proposed project?
6. To what extent the negative impacts could influence on local environment?
7. What is your attitude toward to the influence of the proposed project?

During the survey, the proposed project owner also investigated local government for their comments toward to the proposed project.

E.2. Summary of the comments received:

>>

The following is a summary of the key findings:

1) All the respondents know and support the construction of the proposed project;
2) 94% of the respondents support the development of CDM project, the rest 6% seem not to care for that;
3) 98% deeply believe that the proposed project will bring positive impacts to their daily life, others have no idea.
4) 96% of the respondents consider the proposed project will contribute to local economic development, others do not know.
5) In regarding to the impacts on local environment, 73% of the respondents consider the proposed project has no negative impact on local environment, the rest 27% think that the negative impact on local environment from the proposed project is little.
6) 96% believe that the benefits brought from proposed project are obviously more than the negative impacts. The rest think there is no influence any more.

Conclusion

[29] This questionnaire was only carried out by the former project owner under the consideration that all the related project documents like FSR and EIA etc. were all transferred to the current owner, and the project nature, scale, the technologies adopted, as well as the project site etc. have not changed. And the local stakeholders are insistently supportive to the proposed project and without any influences caused by the change of the project owner.

The survey shows that the proposed project receives strong support from local people. The respondents generally deemed that the proposed project generate reliable electricity, accelerate the economic development, and induce some other multiple benefits relating to their livelihoods.

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

>>

The local residents and authorities are all supportive of the proposed project, therefore there is no need to modify the proposed project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the proposed project.

Annex 3

BASELINE INFORMATION

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Please refer to the following official websites issued by DNA for the procedure of OM and BM calculation of Northwest China Grid:

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081231101111351.pdf

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1888.pdf

Table A. Calculation of Simple OM emission factor of North China Power Grid

Table A1. Basic data of the North China Power Grid in 2004

	Electricity generation and supply by thermal power plants			Installed capacity（MW）				
	Electricity generation（MWh）	Power self-consumption rate (%)	Power supply to the Grid (MWh)	Hydro power	Fuel-fired power	Nuclear power	Other	Total
Beijing	18,579,000	7.94%	17,103,827	1,055.9	3,458.5	0	0	4,514.4
Tianjin	33,952,000	6.35%	31,796,048	5.0	6,008.5	0	0	6,013.5
Hebei	124,970,000	6.50%	116,846,950	783.8	19,932.7	0	13.5	20,730.0
Shanxi	104,926,000	7.70%	96,846,698	787.3	17,693.3	0	0	18,480.6
Inner Mongolia	80,427,000	7.17%	74,660,384	567.9	13,641.5	0	111.7	14,321.1
Shandong	163,918,000	7.32%	151,919,202	50.8	32,860.4	0	12.3	32,923.5
Sum	526,772,000	—	489,173,110	3,250.7	93,594.9	0	137.5	96,983.1
Share	Electricity Import* (MWh) 4,514,550	Total power supply (MWh)	493,687,660	3.35%	96.51%	0.00%	0.14%	

Data source: China Electric Power Yearbook 2005 *Electricity import from Northeast China Power Grid

Table A2. Basic data of the North China Power Grid in 2005

	Electricity generation and supply by thermal power plants				Installed capacity（MW）				
	Electricity generation （MWh）		Power self-consumption rate (%)	Power supply to the Grid (MWh)	Hydro power	Fuel-fired power	Nuclear power	Other	Total
Beijing	20880000		7.73%	19,265,976	1,025.00	3,833.50	0	24	4,882.50
Tianjin	36993000		6.63%	34,540,364	5.00	6,149.90	0	24	6,178.90
Hebei	134348000		6.57%	125,521,336	784.50	22,333.20	0	48	23,165.70
Shanxi	128785000		7.42%	119,229,153	783.00	22,246.80	0	0	23,029.80
Inner Mongolia	92345000		7.01%	85,871,616	567.90	19,173.30	0	208.9	19,950.10
Shandong	189880000		7.14%	176,322,568	50.80	37,332.00	0	30.6	37,413.40
Sum	603231000		—	560,751,013	3,216.20	111,068.70	0.00	335.50	114,620.40
Share	Electricity Import* (MWh)	3,929,000	Total power supply (MWh)	564,680,013	2.81%	96.90%	0.00%	0.29%	

Data source: China Electric Power Yearbook 2006 *Electricity import from Northeast China Power Grid

Table A3. Basic data of the North China Power Grid in 2006

	Electricity generation and supply by thermal power plants				Installed capacity（MW）				
	Electricity generation （MWh）		Power self-consumption rate (%)	Power supply to the Grid (MWh)	Hydro power	Fuel-fired power	Nuclear power	Other	Total
Beijing	20,705,000		7.51%	19,150,055	1053	3984	0	24	5061
Tianjin	35,924,000		6.86%	33,459,614	5	6512	0	24	6541
Hebei	143,888,000		6.63%	134,348,226	785	26087	0	218	27090
Shanxi	150,250,000		7.45%	139,056,375	790	26661	0	0	27451
Inner Mongolia	139,593,000		7.58%	129,011,851	818	28899	0	565	30282
Shandong	230,922,000		7.12%	214,480,354	553	49395	0	106	50054
Sum	721,282,000		—	669,506,473	4004	141538	0	937	146479
Share	Electricity Import* (MWh)	2,618,060 497,060	Total power supply (MWh)	672,621,593	2.73%	96.63%	0.00%	0.64%	

Data source: China Electric Power Yearbook 2007 * Electricity import from Northeast and Central China Power Grid

Table A4 Simple OM emission factor of the North China Power Grid in 2004

	Fi							Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	BEIJING (10^4t) (10^8m^3) **A**	TIANJIN (10^4t) (10^8m^3) **B**	HEBEI (10^4t) (10^8m^3) **C**	SHANXI (10^4t) (10^8m^3) **D**	NEIMEN (10^4t) (10^8m^3) **E**	SHANDONG (10^4t) (10^8m^3) **F**	Total (10^4t) (10^8m^3) **G=A+B+C+D+E+F**	**H**	**I=H*44/12**	**J**	**K**	**L=G*H*I*J*10^{-2}**
RAW COAL	823.09	1410	6299.8	5213.2	4932.2	8550	27,228.29	25.8	94.6	20,908	1	538,547,477
CLEANED COAL	0	0	0	0	0	40	40.00	25.8	94.6	26,344	1	996,857
OTHER WASHED COAL	6.48	0	101.04	354.17	0	284.22	745.91	25.8	94.6	8,363	1	5,901,191
COKE	0	0	0	0	0.22	0	0.22	29.2	107.1	28,435	1	6,698
COKE OVEN GAS	0.55	0	0.54	5.32	0.4	8.73	15.54	12.1	44.4	16,726	1	1,153,187
Other gas	17.74	0	24.25	8.2	16.47	1.41	68.07	12.1	44.4	5,227	1	1,578,574
Crude oil	0	0	0	0	0	0	0.00	20	73.3	41,816	1	0
Gasoline								18.9	69.3	43,070	1	0
Diesel	0.39	0.84	4.66	0	0		5.89	20.2	74.1	42,652	1	186,070
Fuel oil	14.66	0	0.16				14.82	21.1	77.4	41,816	1	479,451
LPG	0	0	0	0	0		0.00	17.2	63.1	50,179	1	0
Refinery gas	0	0.55	1.42	0	0		1.97	15.7	57.6	46,055	1	52,229
Natural gas	0	0.37	0	0.19			0.56	15.3	56.1	38,931	1	122,306
Other petroleum products*	0	0	0	0	0		0.00	20	73.3	38,369	1	0
Other coking products	0	0	0	0	0		0.00	25.8	94.6	28,435	1	0
Other energy(renewable energy or waste	9.41	0	34.64	109.73	4.48		158.26	0	0.0	0	1	0
Emission of the North China Power Grid (tCO2e)	549,024,041											
Net electricity import from Northest China Power Grid to the North China Power Grid (MWh)	4,514,550											
Average emission factor of the Northeast China Grid (tCO_2e/MWh)	1.17384											
Total emission of the North China Power Grid (tCO_2e)	554,323,387											
Fossil power supply of the North China Power Grid (MWh)	493,687,660											
OM emission factor of the North China Power Grid (tCO_2e/MWh)	1.12282											

Data source: China Energy Statistical Yearbook (2005)

Table A5 Simple OM emission factor of the North China Power Grid in 2005

	Fi							Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	BEIJING (10^4t) (10^8m^3) **A**	TIANJIN (10^4t) (10^8m^3) **B**	HEBEI (10^4t) (10^8m^3) **C**	SHANXI (10^4t) (10^8m^3) **D**	NEIMENGGU (10^4t) (10^8m^3) **E**	SHANDONG (10^4t) (10^8m^3) **F**	Total (10^4t) (10^8m^3) **G=Sum(A:F)**	**H**	**I=H*44/12**	**J**	**K**	**$L=G*H*I*J*10^{-2}$**
RAW COAL	897.75	1675.2	6726.5	6176.45	6277.23	10405.4	32,158.53	25.8	94.6	20,908	1	636,062,536
CLEANED COAL	0	0	0	0	0	42.18	42.18	25.8	94.6	26,344	1	1,051,186
OTHER WASHED COAL	6.57	0	167.45	373.65	0	108.69	656.36	25.8	94.6	8,363	1	5,192,725
COKE	0	0	0	0	0.21	0.11	0.32	29.2	107.1	28,435	1	9,742
COKE OVEN GAS	0.64	0.75	0.62	21.08	0.39	0	23.48	12.1	44.4	16,726	1	1,742,396
Other gas	16.09	7.86	38.83	9.88	18.37	0	91.03	12.1	44.4	5,227	1	2,111,027
Crude oil	0	0	0	0	0.73	0	0.73	20	73.3	41,816	1	22,385
Gasoline	0	0	0.01	0	0	0	0.01	18.9	69.3	43,070	1	298
Diesel	0.48	0	3.54	0	0.12	0	4.14	20.2	74.1	42,652	1	130,786
Fuel oil	12.25	0	0.23	0	0.06	0	12.54	21.1	77.4	41,816	1	405,690
LPG	0	0	0	0	0	0	0.00	17.2	63.1	50,179	1	0
Refinery gas	0	0	9.02	0	0	0	9.02	15.7	57.6	46,055	1	239,141
Natural gas	0.28	0.08	0	2.76	0	0	3.12	15.3	56.1	38,931	1	681,417
Other petroleum products*	0	0	0	0	0	0	0.00	20	73.3	38,369	1	0
Other coking products	0	0	0	0	0	0	0.00	25.8	94.6	28,435	1	0
Other energy(renewable energy or waste heating)	8.58	0	32.35	69.31	7.27	118.9	236.41	0	0.0	0	1	0
Emission of the North China Power Grid (tCO2e)							647,649,331					

Net electricity import from Northest China Power Grid to the North China Power Grid (MWh)	3,929,000
Average emission factor of the Northeast China Grid (tCO_2e/MWh)	1.15764
Total emission of the North China Power Grid (tCO_2e)	652,197,697
Fossil power supply of the North China Power Grid (MWh)	564,680,013
OM emission factor of the North China Power Grid (tCO_2e/MWh)	1.15499

Data source: China Energy Statistical Yearbook (2006)

Table A6 Simple OM emission factor of the North China Power Grid in 2006

	Fi							Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	BEIJIGN (10^4t) (10^8m^3) **A**	TIANJIN (10^4t) (10^8m^3) **B**	HEBEI (10^4t) (10^8m^3) **C**	SHANXI (10^4t) (10^8m^3) **D**	NEIMENGGU (10^4t) (10^8m^3) **E**	SHANDONG (10^4t) (10^8m^3) **F**	Total (10^4t) (10^8m^3) **G=A+B+C+D+E+F**	**H**	**I=H*44/12**	**J**	**K**	**L=G*H*I*J*10^{-2}**
RAW COAL	796.63	1639.2	6867.99	6968.88	8404.05	10930.66	35,607.41	25.8	94.6	20,908.00	1	704,277,823
CLEANED COAL	0	0	0	0	0	39. 77	39.77	25.8	94.6	26,344.00	1	991,125
OTHER WASHED COAL	6.36	0	214. 13	371. 14	61.77	544. 6	1,198.00	25.8	94.6	8,363.00	1	9,477,855
MOULDED COAL	7. 97	0	0	0	0.00	27.77	35.74	26.6	97.5	20,908.00	1	728,820
COKE	0	0	0	0	0	3. 23	3.23	29.2	107.1	28,435.00	1	98,335
COKE OVEN GAS	0. 38	0. 63	5.8	22. 32	0. 64	5. 79	35.56	12.1	44.4	16,726.00	1	2,638,825
Other gas	20. 66	6. 58	69. 72	13. 79	22. 76	7. 22	140.73	12.1	44.4	5,227.00	1	3,263,593
Crude oil	0	0	0	0	0. 74	0	0.74	20	73.3	41,816.00	1	22,692
Gasoline	0	0	0. 01	0	0	0	0.01	18.9	69.3	43,070.00	1	298
Diesel	0.21	0	3.01	0	0.07	6. 32	9.61	20.2	74.1	42,652.00	1	303,589
Fuel oil	6.38	0	0.08	0	0	4.1	10.56	21.1	77.4	41,816.00	1	341,633
LPG	0	0	0	0	0	0. 01	0.01	17.2	63.1	50,179.00	1	316
Refinery gas	0	0	2. 43	0	0	2. 32	4.75	15.7	57.6	46,055.00	1	125,934
Natural gas	3. 41	0. 73	0	0. 53	0	0	4.67	15.3	56.1	38,931.00	1	1,019,942
Other petroleum products*	0	0	0	0	0	0. 28	0.28	20	73.3	38,369.00	1	7,878
Other coking products	0	0	0	0	0	0	0.00	25.8	94.6	28,435.00	1	0.00
Other energy(renewable energy or waste heating)	6. 83	0	47. 11	230. 76	12.51	132. 29	429.50	0	0.0	0	0	0.00
Emission of the North China Power Grid (tCO2e)	723,298,659											

Net electricity import from Northest China Power Grid to the North China Power Grid (MWh)	2,618,060
Average emission factor of the Northeast China Grid (tCO_2e/MWh)	1.16688
Net electricity import from Central China Power Grid to the North China Power Grid (MWh)	497,060
Average emission factor of the Central China Grid (tCO2e/MWh)	0.77134
Total emission of the North China Power Grid (tCO_2e)	726,737,018
Fossil power supply of the North China Power Grid (MWh)	672,621,593
OM emission factor of the North China Power Grid (tCO_2e/MWh)	1.08045

Data source: China Energy Statistical Yearbook (2007)

Table A7 Simple OM of the North China Power Grid

CO2 Emission of North China Power Grid (tCO2e)			Power Supply of North China Power Grid		
2004	2005	2006	2004	2005	2006
554,323,386.99	652,197,697.01	726,737,018.32	493,687,659.90	564,680,013.00	672,621,592.90
Total	1,933,258,102.32		Total	1,730,989,265.80	
EF_OM (tCO2/MWh)	1.11685				

Table B. Calculation of BM emission factor of North China Power Grid

Table B1. Emission Factor of Newly Built Thermal Power Plants of North China Power Grid

	Carbon Emission Factors (tC/Tj)[1)] **A**	EF_{CO2} (tCO_2/Tj) **B=A*44/12**	OXIDi **C**	Power Supply Efficiency of The Best Power Technology (%) **D**	Emission Factor of Best Techonology (tCO_2e/MWh) E=**3.6/D/1000*B*C**	The mix of thermal power capacity of North China Power Grid in 2006 **H**	$EF_{new\ thermal\ plants}$ (tCO2e/MWh) **I**
Standard Coal	25.8	94.6	1	37.28%	0.9135	98.93%	0.9083
Fuel Oil/diesel	21.1	77.4	1	48.81%	0.5706	0.09%	
Natrual Gas	15.3	56.1	1	48.81%	0.4138	0.97%	

Table B2. Weighted Average Build Margin Emission Factor

	Installed Capacity 2004 (MW) A	Installed Capacity 2005 (MW) B	Installed Capacity 2006 (MW) C	New Capacity Additions (MW) D	Split of Electricity generation from New Capacity E	Emission Factor of Newly Bulit Thermal Power Plants (tCO_2e/MWh) F	Weighted Average Build Margin Emission Factor $EF_{BM,y}$ (tCO_2e/MWh) G
Source	Table A2	Table A3	Table A1	D=C-B	E=D/Total D	Table B1	G=F*E
Hydro Power Plant	3,250.70	3,216.20	4,004.00	787.80	2.47%	0	0
Thermal Power Plant	93,594.90	111,068.70	141,538.00	30,469.30	95.64%	0.9083	0.8687
Nuclear Power	0.00	0.00	0.00	0.00	0.00%	0	0
Others	137.5	335.5	937	601.50	1.89%	0	0
Total	96,983.10	114,620.40	146,479.00	31,858.60	100.00%		0.8687
Percentage of the Installed Capacity of 2006	66.21%	78.25%	—	21.75%			

Table C. Calculation Of Combined Margin Factor of North China Power Grid

EF_OM (tCO2e/MWh)	EF_BM (tCO2e/MWh)	EF (tCO2e/MWh)
1.1169	0.8687	1.0548

Annex 4

MONITORING INFORMATION

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See section B.7.2.