



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

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

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Yuxian Baiyantuo 49.3 MW Wind Power Project

Version number of the document: 03

Date: 16/05/2011

A.2. Description of the project activity:

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Yuxian Baiyantuo 49.3 MW Wind Power Project (hereinafter referred to as the Project) is located in Yu County, Zhangjiakou City, Hebei Province, P.R.China. It is invested, constructed and operated by Hebei Construction Investment Yuzhou Wind Energy Co., Ltd.

The total installed capacity of the Project is 49.3 MW equipped with 58 sets of wind turbines with a unit installed capacity of 850 kW. The estimated net electricity supplied to North China Grid by the Project is 104,713.2 MWh per year and the plant load factor is 0.2424. Electricity generated by the Project will be supplied to North China Grid via a 110 kV transmission line.

North China Grid is dominated by thermal power plants. In the absence of the Project, equivalent amount of annual power output to the Project will be generated and supplied by North China Grid which the Project is connected to. This is the same with the baseline scenario of the Project. It is expected that the Project as a renewable energy source will generate emission reductions of about 99,501 tCO₂e per year by avoiding CO₂ emissions from the same amount of electricity generation from North China Grid, which is mainly composed of traditional thermal power plants.

The Project will not only supply renewable electricity to the grid, but also contribute to sustainable development of the local community, the host country and the world by means of:

- ♦ reducing greenhouse gas emissions compared to a business-as-usual scenario;
- ♦ diversifying power sources and mitigating the demand and supply contradiction;
- ♦ helping to stimulate the growth of the wind power industry and encourage and promote the technology progress and commercial popularization of grid-connected renewable power generation projects in China;
- ♦ reducing the emission of other pollutants resulting from the power generation industry in China, compared to a business-as-usual scenario;
- ♦ creating 10 employment opportunities for local community during the operation period of the Project and creating several employment opportunities for local community during the construction period of the Project.

A.3. Project participants:

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Project participants to the Project are the following:



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)
P.R.China (host)	Hebei Construction Investment Yuzhou Wind Energy Co., Ltd. (the Project Owner)	Yes

Detailed contact information of the project participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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The host country is the People's Republic of China.

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

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Hebei Province

A.4.1.3. City/Town/Community etc:

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Yu County, Zhangjiakou City

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 Project is located in Yu County, Zhangjiakou City, Hebei Province, P.R.China. The center of the Project has geographical coordinates with east longitude of 114°33'06" and north latitude of 39°40'32". The area of the wind farm is about 21 km². Figure 1 shows the location of Hebei Province, Figure 2 shows the location of Zhangjiakou City. Figure 3 shows the location of the Project.

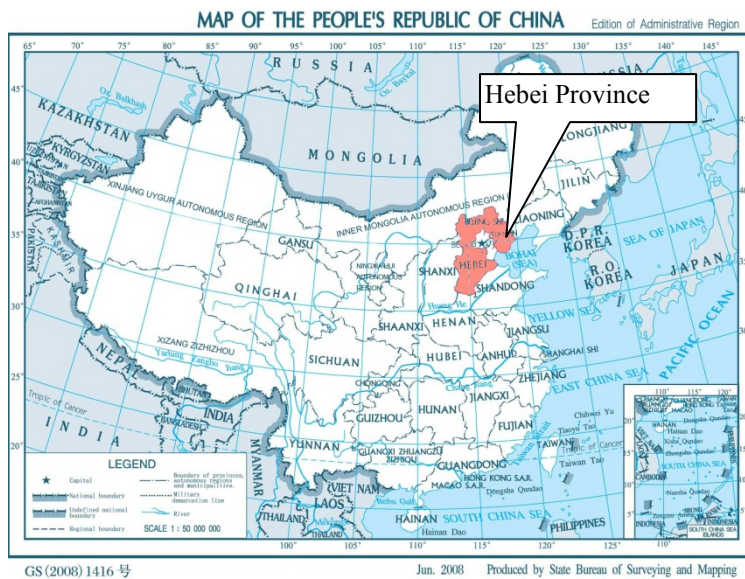


Figure 1. Location of Hebei Province

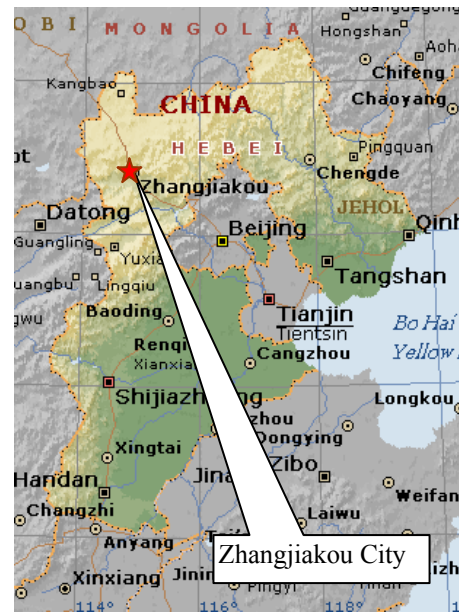


Figure 2. Location of Zhangjiakou City



Figure 3. Location of the Project

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

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The Project falls into sectoral scope 1: energy industries (renewable sources).

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

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In the absence of the Project, equivalent amount of annual power output to the Project will be generated and supplied by North China Grid which the Project is connected to. This is the same with the baseline scenario of the Project. It is expected that the Project as a renewable energy source will generate emission reductions by avoiding CO₂ emissions from the same amount of electricity generation from North China Grid, which is mainly composed of traditional thermal power plants.



According to the meteorological data of the anemometer tower setup within the Project Site, there is abundant wind resource at the Project Site. The annual average wind speed is 7.4 m/s at 70 m height with stable prevailing wind direction. Thus it is suitable to build grid-connected wind power generation projects at the Project Site.

The total installed capacity of the Project is 49.3 MW equipped with 58 sets of wind turbines with a unit installed capacity of 850 kW. The estimated net electricity supplied to North China Grid by the Project is 104,713.2 MWh per year and the plant load factor is 0.2424. Electricity generated by the Project will be supplied to North China Grid via a 110 kV transmission line.

Table 1. Main technical parameters of key equipments in the Project

	Equipment	Quantity	Type	Technical parameters	Data sources
Main mechanical and electrical equipments	Turbine	35 sets	G52-850 kW (Low Temperature)	Rated power: 850 kW Quantity of blades: 3 Rotor diameter: 52 m Rotor speed: 14.6~30.8 r/min Lifetime: 20 yrs	The Feasibility Study Report (hereinafter referred to as the FSR) and Wind Turbine Technical Specification of the Project
		23 sets	G58-850 kW (Low Temperature)	Rated power: 850 kW Quantity of blades: 3 Rotor speed: 14.6~30.8 r/min Rotor diameter: 58 m Lifetime: 20 yrs	
	35 kV packaged substation	58 sets	S10-900/35	-	
Shared step-up substation	Main transformer	1 set	SZ10-100000/110	Capacity: 100 MVA Rated voltage: 110 kV	

The Project employs turbines manufactured by GAMESA, which involves no technology transfer from abroad.

The net electricity supplied to North China Grid by the Project will be monitored with one bi-directional meter installed at the Project Site. The measurement precision of the meter employed by the Project will be 0.2s.

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

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Renewable crediting period (7yrs×3) is adopted by the Project. It is expected that the Project will generate emission reductions of about 696,507 tCO₂e over the first 7-year crediting period from August 1, 2011 to July 31, 2018.

Years	Annual estimation of emission reductions in tonnes of CO ₂ e
August 1, 2011 ~ December 31, 2011	41,459
2012	99,501
2013	99,501
2014	99,501
2015	99,501
2016	99,501
2017	99,501
January 1, 2018 ~ July 31, 2018	58,042
Total estimated reductions (tonnes of CO₂e)	696,507



Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	99,501

A.4.5. Public funding of the project activity:

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There is no public funding from Annex I Parties for the 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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Approved consolidated baseline and monitoring methodology ACM0002 (version 12.1.0, published on November 26, 2010): *Consolidated Baseline Methodology for Grid-Connected Electricity Generation from Renewable Sources* and monitoring methodology.

Tool to Calculate the Emission Factor for an Electricity System (version 02.1.0).

Tool for the Demonstration and Assessment of Additionality (version 05.2).

For more information regarding the methodology please refer to
<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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Wind power generation technology is a renewable power generation technology which displaces fossil fuel fired power generation technology to supply electricity to the grid. Therefore the Project applies the methodology ACM0002 approved by CDM EB to determine the project baseline and calculate emission reductions achieved by wind power generation.

The Project meets all applicable requirements of the methodology ACM0002 as follows:

- 1) The Project is a grid-connected wind power generation project activity that installs a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity.
- 2) The Project does not involve switching from fossil fuels to renewable energy at the site of the project activity.

In addition, the applicability and the application of the tools listed in Section B.1 of the PDD to the Project are demonstrated below.

- The Project is a grid-connected power generation project, therefore, *Tool to Calculate the Emission Factor for an Electricity System* is applicable to the Project. It is applied to determine the emission factor of the electricity system.
- As specified in Section B.4 and B.5, there is one credible and feasible alternative which is more attractive than the Project. Therefore, *Tool for the Demonstration and Assessment of Additionality* is applicable to the Project. It is applied to demonstrate and assess the additionality of the Project.

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

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The spatial extent of the Project Boundary includes the Project Power Plant and all the power plants connected physically and geographically to North China Grid that the Project is connected to.

The Project Power Plant includes the main control room, the multipurpose building, 58 sets of wind turbines with a unit installed capacity of 850 kW and relevant auxiliaries.

Electricity generated by the Project will be supplied to North China Grid. According to *Announcement to*



*Publish 2009 Baseline Emission Factors for Regional Power Grids in China*¹ issued by China's DNA which provides the delineation of grid boundaries, North China Grid is the grid boundary of the Project. North China Grid is composed of Beijing Power Grid, Tianjin Power Grid, Hebei Power Grid, Shanxi Power Grid, Shandong Power Grid and Inner Mongolia Power Grid.

As described above, the spatial extent of the Project Boundary includes the wind farm, auxiliary facilities of the wind farm and all the power plants/units connected physically to Beijing Power Grid, Tianjin Power Grid, Hebei Power Grid, Shanxi Power Grid, Shandong Power Grid and Inner Mongolia Power Grid.

Table 2. Emission sources included in or excluded from the Project Boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation of North China Grid.	CO ₂	Yes	Main emission sources.
		CH ₄	No	Minor emission source.
		N ₂ O	No	Minor emission source.
Project activity	CO ₂ emissions of the Project	CO ₂	No	As the Project is a wind power project, excluded as per the methodology ACM0002.
		CH ₄	No	As the Project is a wind power project, excluded as per the methodology ACM0002.
		N ₂ O	No	As the Project is a wind power project, excluded as per the methodology ACM0002.

¹ China's DNA (http://qhs.ndrc.gov.cn/qjzjz/t20090703_289357.htm).

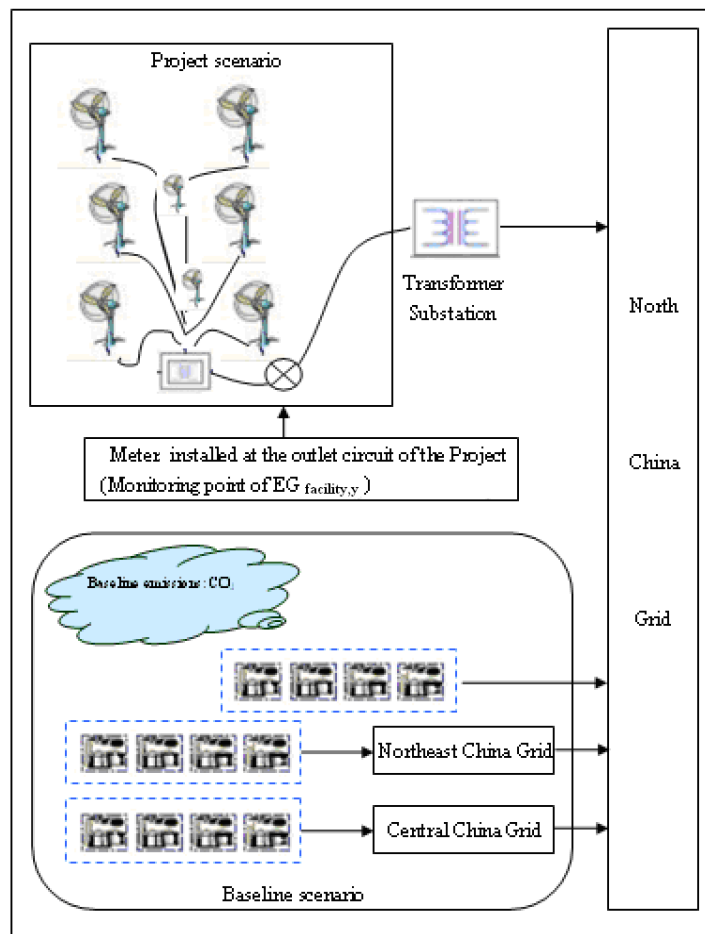


Figure 4. The Project Boundary and relevant emission sources

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

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According to the methodology ACM0002, if the Project is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity supplied to the grid by the Project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in *Tool to Calculate the Emission Factor for an Electricity System*.

The Project is the installation of a new grid-connected renewable power plant that connects with and supplies electricity to North China Grid. According to *Tool to Calculate the Emission Factor for an Electricity System*, the delineation of grid boundaries of the Project is North China Grid. According to the methodology ACM0002, the baseline scenario of the Project is “the provision of an equivalent amount of annual power output by North China Grid which the Project is connected to”. For detailed analysis please refer to Section B.5.

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

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The additionality of the Project is demonstrated and assessed by using *Tool for the Demonstration and Assessment of Additionality* (version 05.2) approved by CDM EB.

Wind Turbine Supply Contract of the Project was signed on November 19, 2009, *Civil Engineering Contract* of the Project was signed on November 25, 2009 and construction of the Project was started on December 22, 2009. According to the definition of “the starting date of a CDM project activity” provided in *Glossary of CDM terms* (version 05), the starting date of the Project is November 19, 2009. China's DNA was informed of the intention to implement CDM development of the Project on March 25, 2010, and the confirmation was got on April 19, 2010. UNFCCC secretariat was informed of the intention to implement CDM development of the Project on April 12, 2010. According to *Guidance on the Demonstration and Assessment of Prior Consideration of the CDM* (version 03), as described above, CDM was seriously considered in the decision to implement the Project.

Table 3 below provides an overview of milestones of the Project:

Table 3. Overview of milestones of the Project

Time	Milestone
December, 2008	The FSR of the Project was finished.
February 18, 2009	The Environmental Impact Assessment Form (EIA Form) of the Project was finished.
March 31, 2009	The EIA Form of the Project was approved by Environmental Protection Bureau of Hebei Province.
July 27, 2009	The FSR of the Project was approved by Hebei Development and Reform Commission.
August 5, 2009	The Project Owner decided to go through the CDM process for the Project.
November 19, 2009	<i>Wind Turbine Supply Contract</i> was signed.
November 25, 2009	<i>Civil Engineering Contract</i> was signed.
December 22, 2009	Construction of the Project was started.
March 25, 2010	China's DNA was informed of the intention to implement CDM development of the Project.
April 12, 2010	UNFCCC secretariat was informed of the intention to implement CDM development of the Project.
July 22, 2010	The PDD was publicly available on UNFCCC website.
August 20, 2010	<i>Loan Contract</i> was signed.

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

The objective of Step 1 is to define realistic and credible baseline alternatives to the Project that can be the baseline scenario through the following sub-steps:

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

Plausible and credible baseline alternatives available to the Project that provide outputs or services comparable to the proposed CDM project activity include:

Baseline alternative I: Construction of a thermal power plant with an equivalent amount of annual electricity generation;

Baseline alternative II: The Project undertaken without being registered as a CDM project activity;

Baseline alternative III: Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity generation; and

Baseline alternative IV: Provision of an equivalent amount of annual power output by North China Grid which the Project is connected to.

Biomass power generation projects are blocked by short supply and high price of biomass fuels, and uncontrollable cost of power generation², so it is not feasible to construct a biomass power generation

² [Http://www.in-en.com/newenergy/html/newenergy-2026202657765306.html](http://www.in-en.com/newenergy/html/newenergy-2026202657765306.html).



project instead of the Project. Hebei Province, where the Project is sited, is in great shortage of water resources, especially surface water resources, so there is no economically exploitable water resource with a commensurate scale to the Project³. Since solar PV is blocked by high cost and technology, and faces some technology and financial barriers in China⁴. Furthermore, there is no economically exploitable geothermal resource⁵ with a commensurate scale to the Project in Hebei Province. Therefore, Baseline alternative III is not feasible.

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

For Baseline alternative I, the installed capacity of the Project is 49.3 MW, considering the same annual electricity generation and the higher PLF of thermal power plants compare to that of wind power projects, the baseline alternative of the Project should be a thermal power plant with an installed capacity not more than 49.3 MW. However, according to China's regulations, construction of thermal power plants with the unit installed capacity of 135 MW or below is prohibited in areas where can be covered by large grids such as provincial grids⁶. Therefore, Baseline alternative I is not feasible.

For Baseline alternative II, the Project is undertaken without being registered as a CDM project activity complies with current laws and regulations in China and does not belong to project types which are forced to be implemented.

For Baseline alternative IV, provision of an equivalent amount of annual power output by North China Grid which the Project is connected to complies with current laws and regulations in China and does not belong to project types which are forced to be implemented.

Therefore, further analysis only focuses on Baseline alternative II and Baseline alternative IV.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

Tool for the Demonstration and Assessment of Additionality version 05.2 suggests three analysis methods which are simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). The Project will earn revenues not only from the CERs but also from electricity sales, so the simple cost analysis method is not appropriate. The Project will use benchmark analysis (Option III) based on the consideration that the benchmark IRR of the power sector is available.

Sub-step 2b. Benchmark Analysis Method (Option III)

According to *Interim Rules on Economic Assessment of Electric Power Engineering Retrofit Projects* (published on September 18, 2002), the benchmark project IRR adopted by the Project is 8% (after tax). On the basis of this benchmark, calculation and comparison of IRR are carried out in sub-step 2c.

Sub-step 2c. Calculation and comparison of IRR

(1) Basic parameters and assumptions

3 <http://www.hbsw.net/news/shuiwenjishu/2009320/0932014I16265F7FF210BJ6G0AK.html>,
<http://www.hbsw.net/news/shuiwenjishu/2009320/09320149HJCF472A52KDF4BF97E.html>.

4 http://www.ce.cn/xwzx/gnsz/gdxw/200910/12/t20091012_20177105.shtml.

5 <http://cn.made-in-china.com/info/article-ZQnJWEtOTxIP.html>.

6 *Circular on Strictly Prohibiting the Violative Installation of Thermal Power Generation Units with the Capacity of 135 MW or Below* issued by the General Office of the State Council, decree no. 2002-6.



Calculation and comparison of IRR is implemented according to *Tool for the Demonstration and Assessment of Additionality*. The FSR of the Project was finalized by Hebei Electric Power Design & Research Institute (HBED) and approved by Hebei Development and Reform Commission. HBED is a qualified organization which has qualification Level I in design and research of electric power engineering. Therefore the FSR is a reliable data source for investment analysis. According to the FSR, the basic parameters and assumptions for calculation of the project IRR of the Project are summarized below.

Installed capacity	49.3	MW
Supplied electricity	104,713.2	MWh
Construction period	1	year
Operation period	20	year
Total investment	56,063.15	10000RMB
Total static investment	54,624	10000RMB
Working capital	147.9	10000RMB
Interest during construction period	1291.25	10000RMB
Interest rate of long-term loan	5.94	%
Interest rate of working capital	5.31	%
Tariff (including VAT)	0.54	RMB/kWh
O&M expenses	1,084	10000RMB
Salary and welfare of employees	58	10000RMB
Maintenance	816	10000RMB
Materials	25	10000RMB
Miscellaneous	49	10000RMB
Insurance	136	10000RMB
VAT	17 ⁷	%
Income tax	25	%
Urban maintenance and construction tax	5	%
Surtax for education	4	%
Depreciation period	15	year
Residual value rate	5	%
Debt Equity ratio	4:1	

(2) Comparison of the project IRR of the benchmark and the Project

In accordance with the benchmark analysis (Option III), if the project IRR of a project is lower than that of the benchmark, the Project is not considered as financially attractive. Based on the above data, without CER revenues, the project IRR is 4.52%, which is lower than that of the benchmark (8%, after tax) of power sector. Therefore, the Project is not financially attractive.

Sub-step 2d. Sensitivity analysis

In the Project, the following financial parameters were taken as uncertain factors for sensitivity analysis of financial attractiveness:

- ♦ Total investment
- ♦ O&M expenses
- ♦ Supplied electricity

⁷ First, according to *Notice about Implementation of VAT Reform in the Whole Country issued by the Ministry of Finance and the State Administration of Taxation* (Cai Shui[2008]170), the input VAT from purchase of equipments of the Project is used to offset the output VAT from sales revenues. Then, according to *Notice of Value Added Tax Policy Regarding Products Using Certain Synthesized Resources and Other Products* (Cai Shui[2008]156), 50% of the taxable VAT is refunded right after it is imposed.

♦ Tariff (including VAT)

The results of sensitivity analysis of the four parameters of the Project are shown in Table 4 and Figure 5.

Table 4. Results of sensitivity analysis
(without CER revenues)

Range Parameter	-10%	-5%	0	+5%	+10%
Total investment	5.96%	5.22%	4.52%	3.87%	3.27%
O&M expenses	4.81%	4.67%	4.52%	4.38%	4.23%
Supplied electricity	3.11%	3.82%	4.52%	5.20%	5.85%
Tariff (including VAT)	3.11%	3.82%	4.52%	5.20%	5.85%

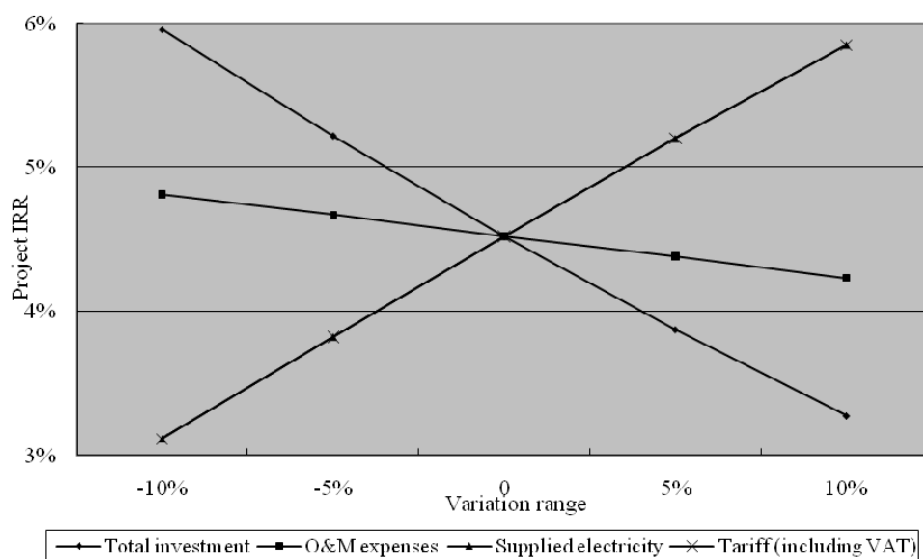


Figure 5. Results of sensitivity analysis
(without CER revenues)

Based on the sensitivity analysis, the project IRR of the Project could reach the benchmark if one of the following conditions can be achieved:

- ♦ The total investment were decreased by at least 21.90%;
- ♦ The O&M expenses were decreased by at least 132.32%;
- ♦ The supplied electricity were increased by at least 27.40%;
- ♦ The tariff were increased by at least 27.40%.

However, none of these conditions can be achieved due to the following reasons:

• **Regarding the total investment**

The FSR of the Project has been finalized by HBED. HBED is a qualified organization which has qualification Level I in design and research of electric power engineering. So the FSR compiled by HBED provides reliable assessment on the total investment of the Project. The total value of the already signed main equipment and construction contracts of the Project accounts for approximately 85% of the total investment estimated in the FSR. Therefore, it is impossible to decrease the total investment in the FSR by 21.90%. Moreover, the equipment cost (mainly turbines and towers) continued to increase from 2007 to 2008. As pointed out by *National Development and Reform Commission Coordinating Office for Major Technical Equipments* in November 2007, the increasing price of key equipments of turbines from



abroad will result in the increase of turbine cost⁸. At the same time, the cost of energy and material kept increasing, which further increased the cost of turbines and towers⁹. Therefore, it is impossible for the total investment of the Project to decrease, even by 21.90%.

- **Regarding the O&M expenses**

It is impossible to decrease the O&M expenses by 100%, even by 132.32%.

- **Regarding the supplied electricity**

Wind data of 35 years duration shows that wind resources at the local area keep decreasing¹⁰. The supplied electricity in the FSR is estimated based on the long term wind resources analysis and one year on-site measurement. When preparing the FSR, the operation hours of each alternative of turbines and the expected power generation are calculated and the selected wind turbine is the one that could fit the local wind resource the best¹¹. Therefore, it is impossible to increase the supplied electricity by 27.40% throughout the lifetime of the Project.

- **Regarding the tariff**

The tariff (including VAT) of wind power projects in Hebei Province kept stable as 0.54 RMB/kWh for years (Document No. NDRC Price [2007]1260, Document No. NDRC Price [2007]3303, Document No. NDRC Price [2008]1876 and Document No. NDRC Price [2009]1906). According to Document No. NDRC Price [2009]1906, the Project located in Type II resource area thus shall apply tariff of 0.54 RMB/kWh (including VAT). The tariff used in the investment analysis from the FSR is 0.54 RMB/kWh (including VAT), which is in line with the government guidance on tariff. Moreover, the project IRR of the Project could reach the benchmark if the tariff of the Project increases by 27.40% (e.g. 0.69 RMB/kWh, including VAT), which is higher than the highest tariff for wind power projects (0.65 RMB/kWh, including VAT) in Hebei Province¹². Therefore, it is impossible to increase the tariff of the Project by 27.40%.

To summarize, the IRR of the Project could not reach the benchmark according to the sensitivity analysis and the additionality of the Project would not be influenced.

If the Project can be successfully registered as a CDM project, the CER revenues will significantly improve the project IRR. Considering the CER revenues (calculated with 17 EURO/tCO₂e, 7 yrs×3 crediting period), the project IRR will be significantly improved to reach the benchmark, as shown in Table 5.

8 National Major Technical Equipments Website

(http://chinanews.xinhuanet.com/jzb/2007-11/22/content_11737734.htm).

9 China Wind Power Website (<http://www.fenglifadian.com/news/53317GG0.html>) and China Securities Journal, August 17, 2008 (http://www.cs.com.cn/jrbznew/html/2008-07/17/content_16499157.htm).

10 Page 20 of the FSR of the Project.

11 Page 73 of the FSR of the Project.

12 *Information Note on the Highest Tariffs Applied by the Executive Board in its Decisions on Registration of Projects in the People's Republic of China* (version 01), published in June 2010.

Table 5. Comparison of the project IRR with and without CER revenues

	the Project	the benchmark
Without CER revenues (%)	4.52	8
With CER revenues (%)	8.96	8

It is shown in Table 5 that the CER revenues can alleviate the identified barriers, therefore the Project is additional.

Step 3 Barrier analysis

Barrier analysis is not employed for the Project, which can satisfy the requirement of *Tool for the Demonstration and Assessment of Additionality*.

Step 4 Common practice analysis

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

In accordance with *Tool for the Demonstration and Assessment of Additionality*, “Similar activities are defined as activities (i.e. technologies or practices) that are of similar scale, take place in a comparable environment, inter alia, with respect to the regulatory framework and are undertaken in the relevant geographical area”. The analysis is restricted to large scale projects (using CDM definition of large scale: >15 MW) as small scale projects are not comparable in scale to the Project. The Project is a newly built wind farm with a total installed capacity of 49.3 MW located in Hebei Province. The Project is approved by the provincial government and tariffs of power plants are priced by the government and different by provinces¹³, so wind power plants located in Hebei Province with the total installed capacity larger than 15 MW are identified as similar project activities with respect to similar technology and similar regulatory framework. Wind farms located in Hebei Province with the total installed capacity larger than 15 MW and a starting date of operation later than January 1, 2002¹⁴ are listed in Table 6 below.

According to *Tool for the Demonstration and Assessment of Additionality*, registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process are not listed in Table 6.

Table 6. Activities similar to the Project¹⁵

No.	Project	Installed capacity (MW)	Commissioning date
1	Chengde Hongsong Wind Farm	51.3	October 2005 ¹⁶
2	Shangyi Manjing Wind Farm	34.5	October 2005 ¹⁷

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

13 Renewable Energy Law of People's Republic of China (<http://www.ah.gov.cn/zfgb/gbcontent.asp?id=3560>), NDRC Price [2009]1906 (http://www.gov.cn/gzdt/2009-07/24/content_1373827.htm).

14 On February 10, 2002, the State Council issued Electric Power System Reform Plan, which suggested a series of measures to break the state monopoly of the electric power industry and establish a government supervised power market system characterized by separation of the government and enterprises, separation of the power plants and power grids and on-grid price bidding. Investment and operation environment for power generation projects in China have fundamentally changed then (<http://news.sohu.com/64/31/news205353164.shtml>).

15 *Installed Capacity of Wind Farms in China in 2007/2008/2009*, by Mr. Shi Pengfei, Vice Chairman of Chinese Wind Association.

(http://www.cwea.org.cn/download/display_info.asp?id=25,

http://www.cwea.org.cn/download/display_info.asp?id=31 and <http://www.windpower-china.com/node/1446>).

16 http://www.hbgrb.net/epaper/html/2008-01/22/content_181309.htm.

17 <http://news.sina.com.cn/o/2005-10-18/02157193758s.shtml>.



Project No.1 was facing serious investment barriers and had applied for carbon funding by selling VER through VCS to alleviate these serious barriers¹⁸.

Project No.2 was facing serious investment barriers and had applied for carbon funding by selling VER through VCS to alleviate these serious barriers¹⁹.

Therefore, all the Projects listed in Table 6 alleviate their investment barriers by applying for carbon funding. Both projects have essential differences with the Project. Therefore, the Project is additional.

To summarize, “the Project is undertaken without being registered as a CDM project activity” is not financially attractive to investors, thus not feasible. Being registered as a CDM project, the CER revenues can alleviate the identified barriers, therefore the Project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The methodology ACM0002 is applied in the context of the Project in the following four steps:

- First, calculate the project emissions;
- Second, calculate the baseline emissions;
- Third, calculate the leakage;
- Fourth, calculate the emission reductions.

I. Calculate the project emissions

The Project is a wind power project and no project emissions should be considered as per the methodology ACM0002, i.e., $PE_y = 0$ tCO₂e.

II. Calculate the baseline emissions

As per the methodology ACM0002, baseline emissions include only CO₂ emissions from electricity generation in North China Grid that the Project is connected to. The baseline emissions are to be calculated as follows:

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

Where:

BE_y is the baseline emissions in year y (tCO₂e);

$EG_{PJ,y}$ is the quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh);

$EF_{grid,CM,y}$ is the combined margin CO₂ emission factor for grid connected power generation in year y calculated using *Tool to Calculate the Emission Factor for an Electricity System* (version 02.1.0) (tCO₂e/MWh).

(1) Calculate the net electricity generation ($EG_{PJ,y}$)

¹⁸ <https://vcsregistry1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=61>.

¹⁹ <https://vcsprojectdatabase1.apx.com/myModule/rpt/myrpt.asp?r=112>.



The Project is the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the Project, so:

$$EG_{PJ,y} = EG_{facility,y} \quad (2)$$

Where:

$EG_{PJ,y}$ is the quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh);

$EG_{facility,y}$ is the quantity of net electricity generation supplied by the Project to the grid in year y (MWh).

(2) Calculate the emission factor for project electricity system ($EF_{grid,CM,y}$)

The combined margin emission factor ($EF_{grid,CM,y}$) of North China Grid, the relevant electricity system identified for the Project, is determined according to following steps:

Step 1. Identify the relevant electricity system

In accordance with *Tool to Calculate the Emission Factor for an Electricity System* (version 02.1.0), the relevant electricity system of the Project is identified according to the delineation of the project electricity system and connected electricity systems published by China's DNA.

Electricity generated by the Project will be supplied to North China Grid. According to *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China* issued by China's DNA which provides the delineation of relevant electricity systems, Hebei Power Grid is an integral part of North China Grid and North China Grid is the relevant electricity system of the Project. North China Grid is composed of Beijing Power Grid, Tianjin Power Grid, Hebei Power Grid, Shanxi Power Grid, Shandong Power Grid and Inner Mongolia Power Grid.

There exists net electricity import from Northeast China Grid and Central China Grid to North China Grid. Northeast China Grid is composed of Liaoning Power Grid, Jilin Power Grid and Heilongjiang Power Grid. Central China Grid is composed of Henan Power Grid, Hubei Power Grid, Hunan Power Grid, Jiangxi Power Grid, Sichuan Power Grid and Chongqing Power Grid. Four methods are provided in *Tool to Calculate the Emission Factor for an Electricity System* to calculate the emission factor of the net electricity import. Referring to *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China*, the simple operating margin emission factor sourced from the electricity supplied by Northeast China Grid and Central China Grid will be used as the emission factor of the net electricity import.

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)

Option I (only grid power plants are included in the calculation) provided in *Tool to Calculate the Emission Factor for an Electricity System* is chosen to calculate the operating margin and build margin emission factor.

Step 3. Select a method to determine the operating margin (OM)

Four methods are provided in *Tool to Calculate the Emission Factor for an Electricity System* for the calculation of operating margin emission factor(s) ($EF_{grid,OM,y}$), they are

- (a) Simple OM, or
- (b) Simple adjusted OM, or
- (c) Dispatch data analysis OM, or
- (d) Average OM.



As per *Tool to Calculate the Emission Factor for an Electricity System*, referring to *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China*, the method (a) simple OM is employed for calculation of the operating margin emission factor(s) ($EF_{grid,OM,y}$) of the Project.

As per *Tool to Calculate the Emission Factor for an Electricity System*, the method (a) simple OM only can be used when low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Among the total electricity generation of North China Grid which the Project is connected to, the amount of low-cost/must run resources accounts for about 1% in 2003, 1% in 2004, 1% in 2005, 1% in 2006 and 1% in 2007, all less than 50%. Thus, the method (a) simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{grid,OM,y}$) of the Project.

For the simple OM, the emission factor can be calculated using either of the two following data vintages:

- *Ex ante* option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation weighted average, based on the most recent data available at the time of submission of the PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the PDD for validation.
- *Ex post* option: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the Project, only grid power plants are included in the calculation. And the *Ex ante* option is adopted by the Project to determine the emission factor. Therefore, the emission factor is determined once at the validation stage and no monitoring and recalculation of the emission factor during the crediting period is required.

Step 4. Calculate the operating margin emission factor ($EF_{grid,OMsimple,y}$) according to the selected method

Two options are provided in *Tool to Calculate the Emission Factor for an Electricity System* for the determination of the simple operating margin emission factor ($EF_{grid,OMsimple,y}$).

Option A: Based on the net electricity generation and a CO₂ emission factor of each unit, or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and the total fuel consumption of the relevant electricity system.

As per *Tool to Calculate the Emission Factor for an Electricity System*, Option B can only be used if:

- (a) The necessary data for Option A is not available; and
- (b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
- (c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

For the Project,

- condition (a) is satisfied for the data on the net electricity generation and CO₂ emission factor of each power unit in North China Grid required by Option A are not available;



- condition (b) is satisfied for only renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known, as summarized in Annex 3; and
- condition (c) is satisfied for Option I has been chosen in Step 2 above, i.e. off-grid power plants are not included in the calculation.

Therefore, Option B (based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the electricity system) is adopted to calculate the simple operating margin emission factor ($EF_{grid,OMsimple,y}$). The formula of $EF_{grid,OMsimple,y}$ calculation is

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (3)$$

$$EG_y = \sum_j GEN_{j,y} \times (1 - r_{j,y}) \quad (3-a)$$

Where:

$EF_{grid,OMsimple,y}$ is the simple operating margin emission factor in year y (tCO₂e/MWh);

$FC_{i,y}$ is the amount of fuel i consumed in North China Grid in year y (mass or volume unit);

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

$EF_{CO2,i,y}$ is the emission factor of fuel i in year y (tCO₂e/GJ);

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

i are all fuel types combusted in power sources in North China Grid in year y;

y is the relevant year as per the data vintage chosen in Step 3;

$GEN_{j,y}$ is total power generation of province j of North China Grid in year y;

$r_{j,y}$ is auxiliary electricity consumption rate of province j of North China Grid in year y.

The data on electricity generation and auxiliary electricity consumption rate for calculating the operating margin emission factor ($EF_{grid,OM,y}$) are obtained from *China Electric Power Yearbook 2006/2007/2008*.

The data on different fuel consumptions for power generation and the net calorific values of the fuels are obtained from *China Energy Statistical Yearbook 2006/2007/2008*. The data on electricity exchange capacity between the power grids are obtained from *Electric Industry Statistics Summary 2005/2006* and *Electric Industry Statistics Collection 2007*. The emission factors of the fuels employed and carbon oxidation rate are obtained from Table 1.3 and Table 1.4 on page 1.21-1.24 of Volume 2 of *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The lower values of the 95% confidence intervals in Table 1.4 are used for the emission factors of the fuels employed.

Since there exists net electricity import from Northeast China Grid and Central China Grid to North China Grid, the simple operating margin emission factor sourced from the electricity supplied by Northeast China Grid and Central China Grid will be used to as the emission factor of the net electricity import.

Referring to *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China*, the simple operating margin emission factor ($EF_{grid,OM,y}$) of North China Grid is 1.0069 tCO₂e/MWh (see Annex 3 for details).

Step 5. Identify the group of power units to be included in the build margin

According to *Tool to Calculate the Emission Factor for an Electricity System*, 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 (MWh) and that have been built most recently.

It is suggested the set of power units that comprises the larger annual generation should be used.

Considering data availability, CDM EB accepts the following deviation in application of methodology²⁰:

- 1) Use of capacity additions during the last several years for estimating the build margin emission factor for grid electricity.
- 2) Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Therefore for the Project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor using the efficiency level of the best technology commercially available in China.

According to *Tool to Calculate the Emission Factor for an Electricity System*, project participants shall choose between one of the following two options to calculate the build margin emission factor ($EF_{grid,BM,y}$).

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the Project or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 is adopted by the Project.

Step 6. Calculate the build margin emission factor

According to the methodology ACM0002, calculate the build margin emission factor ($EF_{grid,BM,y}$) according to *Tool to Calculate the Emission Factor for an Electricity System* using equation (4):

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (4)$$

Where:

20 http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ.

$EF_{grid,BM,y}$ is the build margin emission factor in year y (tCO₂e/MWh);

$EF_{EL,m,y}$ is the emission factor of power unit m in year y (tCO₂e/MWh);

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

m is the power units included in the build margin;

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

$EF_{EL,m,y}$ is calculated according to Option A2 of Step 4(a) (Simple OM) in *Tool to Calculate the Emission Factor for an Electricity System*.

As the data of installed capacity can not be separated into coal fired, oil fired and gas fired currently, the build margin emission factor is calculated by the following steps and formula:

Step a. Calculate the power generation emissions of solid fuel, liquid fuel and gas fuel and each share in the total emissions based on *Energy Balance Table* of the most recent year.

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (5)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (6)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (7)$$

Where:

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by province j in year(s) y;

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

$EF_{CO2,i,y}$ is the emission factor of fuel i in year y (tCO₂e/GJ);

COAL, OIL and GAS are footnote group for solid fuels, liquid fuels and gas fuels.

Step b. Calculate the emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (8)$$

$$EF_{Coal,Adv,y} = FC_{adv,coal} \times NCV_{coal,y} \times EF_{CO2,coal,y} \quad (8-a)$$

$$EF_{oil,Adv,y} = FC_{adv,oil} \times NCV_{oil,y} \times EF_{CO2,oil,y} \quad (8-b)$$

$$EF_{gas,Adv,y} = FC_{adv,gas} \times NCV_{gas,y} \times EF_{CO2,gas,y} \quad (8-c)$$

Where $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are emission factor proxies of efficiency level of the best coal fired, oil fired and gas fired power generation technology commercially available in China.

Step c. Calculate the build margin emission factor of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.



$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (9)$$

$$CAP_{total,y} = \sum_j CAP_{j,y} \quad (9-a)$$

Where:

$CAP_{Total,y}$ is total capacity additions that are close to and exceed 20% of existing capacity;

$CAP_{Thermal,y}$ is capacity additions of thermal power;

$CAP_{j,y}$ is total installed capacity of province j of North China Grid in year y.

The data on different fuel consumptions for power generation and the net calorific values of the fuels are obtained from *China Energy Statistical Yearbook 2008*. The emission factors of the fuels employed are obtained from Table 1.3 and Table 1.4 on page 1.21-1.24 of Chapter 1, Volume 2 of *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The lower values of the 95% confidence intervals in Table 1.4 are used for the emission factors of the fuels employed.

Referring to *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China*, the build margin emission factor ($EF_{grid,BM,y}$) of North China Grid is 0.7802 tCO₂e/MWh.

Step 7. Calculate the combined margin emissions factor

Based on *Tool to Calculate the Emission Factor for an Electricity System*, the combined margin emission factor ($EF_{grid,CM,y}$) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$), as

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times \omega_{OM} + EF_{grid,BM,y} \times \omega_{BM} \quad (10)$$

According to *Tool to Calculate the Emission Factor for an Electricity System*, the weight ω_{OM} is 0.75 and the weight ω_{BM} is 0.25 for wind power projects. Therefore the combined baseline emission factor, i.e. the baseline emission factor of the Project,

$$EF_{grid,CM,y} = 1.0069 \times 0.75 + 0.7802 \times 0.25 = 0.950225 \text{ tCO}_2\text{e/MWh.}$$

III. Calculate the leakage

According to the methodology ACM0002, the leakage of the Project is not considered, i.e. $L_y = 0$ tCO₂e.

IV. Calculate the emission reductions

The Project will generate emission reductions by avoiding CO₂ emissions from electricity generation by fossil fuel power plants. The emission reductions (ER_y) of the Project during a given year y is the difference between the baseline emissions (BE_y) and the project emissions (PE_y). It is calculated as:

$$ER_y = BE_y - PE_y \quad (11)$$

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



Data/Parameter:	$CAP_{j,y}$
Data unit:	MW
Description:	Total installed capacity of province j of North China Grid in year y
Source of data used:	<i>China Electric Power Yearbook 2006/2007/2008</i>
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from <i>China Electric Power Yearbook</i> issued by authorized entity in China are reliable.
Any comment:	-

Data/Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	Total power generation of province j of North China Grid in year y
Source of data used:	<i>China Electric Power Yearbook 2006/2007/2008</i>
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from <i>China Electric Power Yearbook</i> issued by authorized entity in China are reliable.
Any comment:	-

Data/Parameter:	$r_{j,y}$
Data unit:	-
Description:	Auxiliary electricity consumption rate of province j of North China Grid in year y
Source of data used:	<i>China Electric Power Yearbook 2006/2007/2008</i>
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from <i>China Electric Power Yearbook</i> issued by authorized entity in China are reliable.
Any comment:	-



Data/Parameter:	$F_{i,j,y}$
Data unit:	t or m ³
Description:	Consumption of fuel i of province j of North China Grid in year y
Source of data used:	<i>China Energy Statistical Yearbook 2006/2007/2008</i>
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from <i>China Energy Statistical Yearbook</i> issued by authorized entity in China are reliable.
Any comment:	-

Data/Parameter:	$NCV_{i,y}$
Data unit:	TJ per mass or volume unit of fuel i in year y
Description:	Net calorific value of fuel i
Source of data used:	P283 of <i>China Energy Statistical Yearbook 2008</i>
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from <i>China Energy Statistical Yearbook</i> issued by authorized entity in China are reliable.
Any comment:	-

Data/Parameter:	$EF_{CO_2,i,y}$
Data unit:	tC/TJ
Description:	CO ₂ emission factor per unit of energy of the fuel i in year y
Source of data used:	<i>2006 IPCC Guideline for National Greenhouse Gas Inventories</i>
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from <i>2006 IPCC Guideline for National Greenhouse Gas Inventories</i> are reliable.
Any comment:	-



Data/Parameter:	$FC_{adv,coal}$
Data unit:	gCe/kWh
Description:	Weighted average of the fuel consumption for power generation of top 30 sets of 600 MW coal fired power generation units built in 2007 (taken as efficiency level of the best technology commercially available in China)
Source of data used:	<i>Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China</i>
Value applied:	322.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from <i>Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China</i> made publicly available by China's DNA are reliable.
Any comment:	-

Data/Parameter:	$FC_{adv,oil/gas}$
Data unit:	gCe/kWh
Description:	Weighted average of the fuel consumption for power generation of 200 MW oil/gas fired combined cycle power generation units (taken as efficiency level of the best technology commercially available in China)
Source of data used:	<i>Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China</i>
Value applied:	246
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from <i>Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China</i> are reliable.
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

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I. Estimated project emissions:

The Project is a wind power project and no project emissions should be considered as per the methodology ACM0002, i.e. $PE_y = 0 \text{ tCO}_2\text{e}$.

II. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

According to the FSR, the electricity supplied by the Project to the grid is estimated as 104,713.2 MWh per year. According to *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China*, the baseline emission factor of the Project is 0.950225 tCO₂e/MWh. Therefore, the annual baseline emissions of the Project are estimated as 99,501 tCO₂e.

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = 104,713.2 \times 0.950225 = 99,501 \text{ tCO}_2\text{e}$$

**III. Estimated leakage:**

As per the methodology ACM0002, the leakage of the Project is not considered, i.e. $L_y = 0 \text{ tCO}_2\text{e}$.

IV. Estimated emission reductions

As per formula (11), the annual emission reductions of the Project are 99,501 tCO₂e.

$$ER_y = BE_y - PE_y = 99,501 - 0 = 99,501 \text{ tCO}_2\text{e}$$

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

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Renewable crediting period (7yrs×3) is adopted by the Project. It is expected that the Project will generate emission reductions of about 696,507 tCO₂e over the first 7-year crediting period from August 1, 2011 to July 31, 2018.

Year	Estimation of project emissions (tonnes of CO ₂ e)	Estimation of baseline emissions (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of overall emission reductions (tonnes of CO ₂ e)
August 1, 2011 ~ December 31, 2011	0	41,459	0	41,459
2012	0	99,501	0	99,501
2013	0	99,501	0	99,501
2014	0	99,501	0	99,501
2015	0	99,501	0	99,501
2016	0	99,501	0	99,501
2017	0	99,501	0	99,501
January 1, 2018 ~ July 31, 2018	0	58,042	0	58,042
Total (tCO₂e)	0	696,507	0	696,507

B.7 Application of the monitoring methodology and description of the monitoring plan:**B.7.1 Data and parameters monitored:**



Data/Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the Project to the grid in year y
Source of data to be used:	The data used in the PDD are obtained from the FSR of the Project. Actual data will be obtained through on-site measurement.
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	104,713.2
Description of measurement methods and procedures to be applied:	Continuously measured by one bi-directional meter installed on the 35 kV transmission line at the Project Site and monthly recorded.
QA/QC procedures to be applied:	Electricity sales receipt(s) is used for crosscheck. If there exists difference between the monitored data and the data on electricity sales receipt(s), the conservative values will be used to estimate emission reductions.
Any comment:	-

B.7.2 Description of the monitoring plan:

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1. Monitored Data

The ex-ante determined baseline emission factor will be adopted. The quantity of net electricity generation supplied by the Project ($EG_{facility,y}$) will be monitored.

2. Monitoring System Organization Chart

The monitoring system is shown in Figure 6 and implemented by the Project Owner.

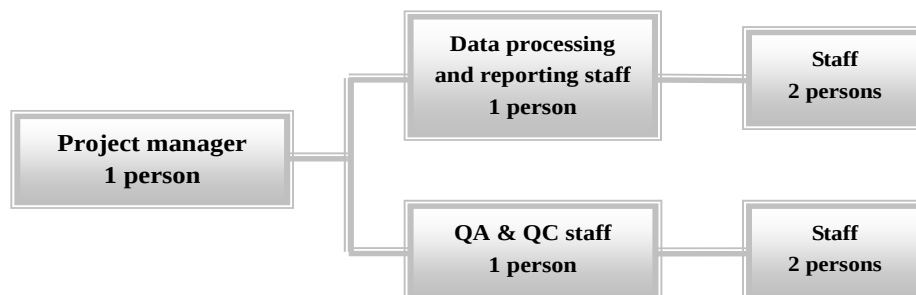


Figure 6. The monitoring system

The Project Manager is responsible for implementation and supervision of the monitoring activity and liaison in this CDM project. The data processing and reporting personnel are responsible for managing, processing and submitting data. The QA & QC personnel are responsible for calibration of meter and supervision of the whole process quality.

3. Installation of Meter



The quantity of net electricity generation supplied by the Project ($EG_{facility,y}$) will be measured continuously by one bi-directional meter installed on the 35 kV transmission line at the Project Site and monthly recorded.

If there exists difference between the monitored data and the data on electricity sales receipt(s), the conservative values will be used to estimate emission reductions.

4. Precision of Meter

The meter of the Project will be equipped in line with *Technical Administrative Code of Electric Energy Metering* (DL/T 448-2000). The measurement precision of the meter employed by the Project will be 0.2s.

5. Calibration of Meter

The meter of the Project will be calibrated once a year.

6. Data Management System

- Particular staff will be appointed by the Project Owner to take the overall responsibility for monitoring emission reductions and keeping all the data collected as part of monitoring archived electronically.
- Electronic data and documents will be regularly copied and archived, and kept at least for two years after the end of the last crediting period or two years after the last issuance of CERs, whichever is later.
- Written data and documents will be copied and archived, and kept for at least two years after the end of the last crediting period or two years after the last issuance of CERs, whichever is later.

7. Quality Assurance and Quality Control Procedure

Particular QC staff will be appointed by the Project Owner to take the overall responsibility of calibrating monitoring equipments, managing and processing the monitored data according to QA/QC procedure provided in Section B.7.1.

In case the main meter is out of order, it shall be inspected, repaired, or replaced immediately by the professional staff and quantity of net electricity generation supplied by the Project to the grid shall be jointly determined by the Project Owner and the power grid company. A conservative and reasonable estimate of the readings shall be determined and conservative values shall be used to estimate emission reductions.

8. Preparation for Verification

Besides the recorded data and the documents for crosscheck required in Section B.7.1, other documents will be prepared by the Project Owner for verification by the DOE including, but not limited to:

- PDD (registration version), including the electronic spreadsheets and supporting documents (assumptions, estimations, measurement, etc);
- Report on maintenance and calibration of meter;
- Report on monitoring.

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)

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The application of the baseline study and monitoring methodology of the Project was completed on 16/05/2011 by:

Entity	Project participate (Yes/No)
PAN Tao Additional Consulting and Engineering Mobile: +86-13911049424 Email: Tao.Pan@Additional.cn	No

**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:**

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19/11/2009 (*Wind Turbine Supply Contract* was signed.)**C.1.2. Expected operational lifetime of the project activity:**

>>

20y-0m

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:**

>>

01/08/2011

C.2.1.2. Length of the first crediting period:

>>

7y-0m

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

>>

Not applicable.

C.2.2.2. Length:

>>

Not applicable.

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

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The EIA Form was approved by Environmental Protection Bureau of Hebei Province on March 31, 2009 (Document No. JHB[2009]47). According to the EIA Form, environmental impacts possibly caused by the Project and treatment measures adopted by the Project Owner are analyzed as follows:

Waste water

Waste water produced during the construction period and the operation period of the Project is mainly domestic waste water of workers. A small quantity of the waste water produced during the construction period will be absorbed by the earth or evaporated, without contaminating the surface ground. The domestic waste water produced during the operation period will be collected and treated in waste water treatment facilities. Then, all the water satisfying safety standards will be reused for the greening and ecological restoration of the wind farm area, without being discharged outside. Thus the domestic waste water will not have any impact on the surroundings.

Dust and exhaust gas

There is no discharge of exhaust gas during the operation period of the Project. During the construction period of the Project, the generation of dust reentrainment is mainly due to excavation, piling, backfilling and transportation of earth, land flattening, road expansion and transportation, loading and unloading and piling of construction materials. Exhaust gas could also be generated from the operation of oil fuelled machines and vehicle running. However, by means of watering and covering the material piling areas and limiting the speed of vehicles, the air pollutant emission of the Project will meet the requirement of *Integrated Emission Standard of Air Pollutants* (GB16297-1996), so the Project will not have any impact on the surroundings.

Noise

Noises generated during the construction period of the Project stem from activities such as excavation and backfilling of earth for the foundation of wind turbines, piling, casting of the foundation platform, installation of the power generation equipments and construction of the multipurpose building and the substation. After attenuation, the noises will meet the requirement of *Noise Limits for Construction Site* (GB12523-90). The noises during the operation period will be reduced through regular maintenance and timely conservation on equipments such as turbines and transformers. As a result, the noises in the plant area and the noises at sensitive sites will meet the requirement of Category I of *Emission Standard for Industrial Enterprises Noise at Boundary* (GB12348-2008).

Solid waste

The solid waste produced during the construction period is mainly spoil, construction waste, domestic waste etc. The spoil will be immediately transported to dump sites. The construction waste and the domestic waste will be transported to the waste disposal site of Yu County by the environmental sanitation administrative department for sanitary landfill. During the operation period of the Project, the domestic waste will be collected and periodically transported to the waste disposal site of Yu County by the environmental sanitation administrative department for sanitary landfill. By taking the measures above, the solid waste produced in the Project will not have any impact on the surroundings.

Ecological impact



Damage to the vegetation caused by permanent land occupation of the Project will be compensated correspondingly. And the damage to vegetation will be recovered in another place with the same area and quality. By taking measures of vegetation recovery and compensation, the Project will have no impact on local ecological environment. Moreover, the main migration route of birds does not go through the region of the Project, so the wind power generation facilities will not impact the migrating birds.

In summary, by means of measures of pollution avoidance and control as well as ecological recovery, the Project will not impact the environment.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

Environmental impacts of the Project are considered not significant by the Project Participants. Environmental impacts of the Project comply with relevant laws and regulations of the host country. Therefore it is not necessary to provide additional information for the Project in this section.



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

>>

Stakeholders of the Project are identified as local residents possibly impacted by the Project. In November 2009, a survey was conducted on the stakeholders of the Project, through distributing and collecting responses to a questionnaire.

The questionnaire is distributed to the local residents near the Project Site. They are of different ages and occupations, coming from different towns and villages. For the total 50 questionnaires distributed to the stakeholders, 50 returned with a response rate of 100%. According to the 50 questionnaires returned, the basic structure of the respondents is illustrated in Table 7.

Table 7. Structure of the respondents

Structure of gender			Structure of educational level			Structure of age		
Gender	No.	Percentage (%)	Educational level	No.	Percentage (%)	Age	No.	Percentage (%)
Male	41	82	Primary school	3	6	Below 30	19	38
Female	9	18	Junior middle school	4	8	30~39	22	44
			Senior middle school	11	22	40~49	7	14
			Technical college or university	32	64	50 and above	2	4

The questionnaires mainly focus on the following issues:

- What's the extent of the stakeholders' knowledge about the Project?
- What's the attitude of the stakeholders on the construction of the Project?
- Where will the necessities of construction of the Project be shown from the view of stakeholders?
- What positive impacts will be introduced by the implementation of the Project from the view of stakeholders?
- What negative impacts will be introduced by the implementation of the Project from the view of stakeholders?

E.2. Summary of the comments received:

>>

According to the 50 questionnaires received:

- 47 respondents (94%) have a certain or very good understanding of the Project and 3 respondents (6%) haven't heard of the Project.
- 49 respondents (98%) support the construction of the Project and 1 respondent (2%) keeps a neutral attitude.
- For the necessities of construction of the Project, 30 respondents (60%) think that the construction of the Project could possibly increase the electricity supplied to the grid, 26 respondents (52%) think that the construction of the Project could possibly improve local employments opportunities, 31 responds (62%) think that the construction of the Project could possibly increase local revenues and 2 respondents(4%) think that the construction of the Project could possibly promote local environmental protection.
- For the positive impacts possibly caused by the implementation of the Project, 12 respondents (24%) think that the implementation of the Project could possibly enhance the available electricity supply to local residents. 10 respondents (20%) think that the implementation of the Project could possibly improve the income of local residents. 27 respondents (54%) think that the implementation of the Project could possibly increase employment opportunities for local residents. 23 respondents (46%) think that the



implementation of the Project could possibly improve local living standards. None of the respondents put forward any other positive impact possibly caused by the implementation of the Project.

- For the negative impacts possibly caused by the implementation of the Project, 26 respondents (52%) think that the implementation of the Project could possibly cause land occupation. 10 respondents (20%) think that the implementation of the Project could possibly result in noise. 5 respondents (10%) think that the implementation of the Project could possibly have a negative impact on birds' survival environment. 6 respondents (12%) think that the implementation of the Project could possibly destroy local ecological environment. None of the respondents put forward other negative impact caused by the implementation of the Project.

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

>>

We know from the results of questionnaire statistics that all the stakeholders understand and support the construction of the Project.

For the issues of noise, birds' survival environment and local ecological environment considered by the respondents, corresponding prevention and control measures have been analyzed in Section D.1 of the PDD. For the issue of land occupation considered by the respondents, the Project will not result in the issue of land occupation since the land required by the Project is mainly grassland and the Project Owner has paid for compensation on land occupation, as described in the FSR.

Thus, there is no necessity to modify the Project in the aspect of design, construction and operation. The Project Owner will think much of the public comments and strictly implement the pollution prevention measures stated in the EIA Form.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Hebei Construction Investment Yuzhou Wind Energy Co., Ltd.
Street/P.O.Box:	No.9 Yuhua West Road
Building:	Room No. 801, Tower A, Yuyuan Plaza
City:	Shijiazhuang City
State/Region:	Hebei Province
Postcode/ZIP:	050000
Country:	People's Republic of China
Telephone:	+86-311-85518612
FAX:	+86-311-85278008
E-Mail:	-
URL:	-
Represented by:	Du Guang
Title:	-
Salutation:	Mr.
Last name:	Du
Middle name:	-
First name:	Guang
Department:	-
Mobile:	-
Direct FAX:	+86-311-85278008
Direct tel:	+86-311-85518612
Personal e-mail:	cdmhecic@gmail.com



Organization:	Department of Climate Change, National Development and Reform Commission
Street/P.O.Box:	Yuetannan Street, Xicheng District
Building:	Room No.38
City:	Beijing City
State/Region:	-
Postcode/ZIP:	100824
Country:	People's Republic of China
Telephone:	+86-10-68502963
FAX:	+86-10-68532358
E-Mail:	sunch@ccchina.gov.cn
URL:	-
Represented by:	Sun Cuihua
Title:	-
Salutation:	Ms.
Last name:	Sun
Middle name:	-
First name:	Cuihua
Department:	-
Mobile:	-
Direct FAX:	+86-10-68532358
Direct tel:	+86-10-68502963
Personal e-mail:	sunch@ccchina.gov.cn



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for the Project.

Annex 3

BASELINE INFORMATION

To determine the simple operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$) of the Project, data recommended in *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China* published on July 2, 2009 for North China Grid are adopted.

The following tables summarise the numerical results from the equations listed in *Tool to Calculate the Emission Factor for an Electricity System*. Information provided by the tables includes data, data sources and the underlying calculations.

Table A1. Thermal power generation of North China Grid in 2005

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity supplied to the grid (MWh)
Beijing	20,880,000	7.73	19,265,976
Tianjin	36,993,000	6.63	34,540,364
Hebei	134,348,000	6.57	125,521,336
Shanxi	128,785,000	7.42	119,229,153
Inner Mongolia	92,345,000	7.01	85,871,616
Shandong	189,880,000	7.14	176,322,568
Total	603,231,000		560,751,013

Data source: China Electric Power Yearbook 2006.

Table A2. Thermal power generation of North China Grid in 2006

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity supplied to the grid (MWh)
Beijing	20,705,000	7.51	19,150,055
Tianjin	35,924,000	6.86	33,459,614
Hebei	143,888,000	6.63	134,348,226
Shanxi	150,250,000	7.45	139,056,375
Inner Mongolia	139,593,000	7.58	129,011,851
Shandong	230,922,000	7.12	214,480,354
Total	721,282,000		669,506,473

Data source: China Electric Power Yearbook 2007.

Table A3. Thermal power generation of North China Grid in 2007

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity supplied to the grid (MWh)
Beijing	22,300,000	7.51	20,625,270
Tianjin	39,900,000	6.53	37,294,530
Hebei	163,300,000	6.67	152,407,890
Shanxi	173,400,000	7.99	159,545,340
Inner Mongolia	180,100,000	7.77	166,106,230
Shandong	259,100,000	7.23	240,367,070
Total	838,100,000		776,346,330

Data source: China Electric Power Yearbook 2008.



Table A4. Calculation of the simple operating margin emission factor of North China Grid in 2005

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Total Fuel G=A+B+...+F	Emission factor (kgCO ₂ /TJ) H	NCV (MJ/t or 1000m ³) I	Emission (tCO ₂ e) ²¹ J
Coal	10 ⁴ t	897.75	1,675.2	6,726.5	6,176.45	6,277.23	10,405.4	32,158.53	87,300	20,908	586,979,486
Cleaned coal	10 ⁴ t	0	0	0	0	0	42.18	42.18	87,300	26,344	970,069
Other washed coal	10 ⁴ t	6.57		167.45	373.65	0	108.69	656.36	87,300	8,363	4,792,018
Coke	10 ⁴ t	0	0	0	0	0.21	0.11	0.32	95,700	28,435	8,708
Coke oven gas	10 ⁸ m ³	0.64	0.75	0.62	21.08	0.39	0	23.48	37,300	16,726	1,464,870
Other gas	10 ⁸ m ³	16.09	7.86	38.83	9.88	18.37	0	91.03	37,300	5,227	1,774,786
Crude oil	10 ⁴ t	0	0	0	0	0.73	0	0.73	71,100	41,816	21,704
Gasoline	10 ⁴ t	0	0	0.01	0	0	0	0.01	67,500	43,070	291
Diesel	10 ⁴ t	0.48	0	3.54	0	0.12	0	4.14	72,600	42,652	128,197
Fuel oil	10 ⁴ t	12.25	0	0.23	0	0.06	0	12.54	75,500	41,816	395,901
Liquefied petroleum gases	10 ⁴ t	0	0	0	0	0	0	0	61,600	50,179	0
Refinery gas	10 ⁴ t	0	0	9.02	0	0	0	9.02	48,200	46,055	200,231
Natural gas	10 ⁸ m ³	0.28	0.08		2.76	0	0	3.12	54,300	38,931	659,553
Other petroleum products	10 ⁴ t	0	0	0	0	0	0	0	75,500	41,816	0
Other coking products	10 ⁴ t	0	0	0	0	0	0	0	95,700	28,435	0
Other energy	10 ⁴ tce	8.58	0	32.35	69.31	7.27	118.9	236.41	0	0	0
Net electricity import from Northeast China Grid to North China Grid (MWh)									3,929,000		
Emission factor of the net electricity imported from Northeast China Grid (tCO₂e/MWh)									1.16489		
Total emission of North China Grid (tCO₂e)									601,972,682		

Data source: China Energy Statistical Yearbook 2006.

²¹ If the unit of the fuel is 10⁴ t, then J=G×H×I/10⁵; if the unit of the fuel is 10⁸ m³, then J=G×H×I/10⁴. The same about the calculation of I in Table A5, Table A6 and Table A7.



Table A5. Calculation of the simple operating margin emission factor of North China Grid in 2006

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Total Fuel G=A+B+...+F	Emission factor (kgCO ₂ /TJ) H	NCV (MJ/t or 1000m ³) I	Emission (tCO ₂ e) J
Coal	10 ⁴ t	796.63	1,639.2	6,867.99	6,968.88	8,404.05	10,930.66	35,607.41	87,300	20,908	649,930,803
Cleaned coal	10 ⁴ t	0	0	0	0	0	39.77	39.77	87,300	26,344	914,643
Other washed coal	10 ⁴ t	6.36	0	214.13	371.14	61.77	544.6	1,198	87,300	8,363	8,746,477
Mould coal	10 ⁴ t	7.97	0	0	0	0	27.77	35.74	87,300	20,908	652,351
Coke	10 ⁴ t	0	0	0	0	0	3.23	3.23	95,700	28,435	87,896
Coke oven gas	10 ⁸ m ³	0.38	0.63	5.8	22.32	0.64	5.79	35.56	37,300	16,726	2,218,517
Other gas	10 ⁸ m ³	20.66	6.58	69.72	13.79	22.76	7.22	140.73	37,300	5,227	2,743,772
Crude oil	10 ⁴ t	0	0	0	0	0.74	0	0.74	71,100	41,816	22,001
Gasoline	10 ⁴ t	0	0	0.01	0	0	0	0.01	67,500	43,070	291
Diesel	10 ⁴ t	0.21	0	3.01	0	0.07	6.32	9.61	72,600	42,652	297,577
Fuel oil	10 ⁴ t	6.38	0	0.08	0	0	4.1	10.56	75,500	41,816	333,391
Liquefied petroleum gases	10 ⁴ t	0	0	0	0	0	0.01	0.01	61,600	50,179	309
Refinery gas	10 ⁴ t	0	0	2.43	0	0	2.32	4.75	48,200	46,055	105,443
Natural gas	10 ⁸ m ³	3.41	0.73		0.53	0	0	4.67	54,300	38,931	987,216
Other petroleum products	10 ⁴ t	0	0	0	0	0	0.28	0.28	75,500	41,816	8,840
Other coking products	10 ⁴ t	0	0	0	0	0	0	0	95,700	28,435	0
Other energy	10 ⁴ tce	6.83	0	47.11	230.76	12.51	132.29	429.5	0	0	0
Net electricity import from Northeast China Grid to North China Grid (MWh)									2,618,060		
Net electricity import from Central China Grid to North China Grid (MWh)									497,060		
Emission factor of the net electricity imported from Northeast China Grid (tCO₂e/MWh)									1.14972		
Emission factor of the net electricity imported from Central China Grid (tCO₂e/MWh)									1.12157		
Total emission of North China Grid (tCO₂e)									670,617,037		

Data source: China Energy Statistical Yearbook 2007.



Table A6. Calculation of the simple operating margin emission factor of North China Grid in 2007

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Total G=A+B+...+F	Emission factor (kgCO ₂ /TJ) H	NCV (MJ/t or 1000m ³) I	CO ₂ emission (tCO ₂ e) J
Raw coal	10 ⁴ t	816.17	1,753.99	7,716.13	7,510.06	10,434.25	11,884.83	40,115.43	87,300	20,908	732,214,267
Cleaned coal	10 ⁴ t	0	0	0	0	0	18.43	18.43	87,300	26,344	423,859
Other washed coal	10 ⁴ t	5.76	0	156.89	478.81	48.57	756.84	1,446.87	87,300	8,363	10,563,452
Briquette	10 ⁴ t	7.93	0	0	0	0	42.86	50.79	87,300	20,908	927,054
Coke	10 ⁴ t	0	0	0.02	0	0	4.09	4.11	95,700	28,435	111,843
Coke oven gas	10 ⁸ m ³	0.07	0.72	3.13	25.46	2.58	13.61	45.57	37,300	16,726	2,843,020
Other gas	10 ⁸ m ³	11.8	7.6	88.38	72.8	28.17	29.64	238.39	37,300	5,227	4,647,821
Crude oil	10 ⁴ t	0	0	0	0	0	0	0	71,100	41,816	0
Gasoline	10 ⁴ t	0	0	0.01	0	0	0	0.01	67,500	43,070	291
Diesel	10 ⁴ t	0.33	0	2.35	0	0.62	5.08	8.38	72,600	42,652	259,490
Fuel oil	10 ⁴ t	4.74	0	0.18	0	0	2.35	7.27	75,500	41,816	229,522
LPG	10 ⁴ t	0	0	0	0	0	0	0	61,600	50,179	0
Refinery gas	10 ⁴ t	0.06	0	2.85	0	0	1.65	4.56	48,200	46,055	101,225
Natural gas	10 ⁸ m ³	5.03	0.73	0	0.54	4.22	0.01	10.53	54,300	38,931	2,225,993
Other oil products	10 ⁴ t	1.72	0	0	0	0	0	1.72	75,500	41,816	54,302
Other energy	10 ⁴ tCe	4.74	0	0	0	0	0	4.74	95,700	28,435	128,986
Net electricity import from Northeast China Grid to North China Grid (MWh)							1,789,750				
Emission factor of the net electricity imported from Northeast China Grid (tCO ₂ e/MWh)							803,000				
Net electricity import from Central China Grid to North China Grid (MWh)							1.08186				
Emission factor of the net electricity imported from Central China Grid (tCO ₂ e/MWh)							1.10197				
Total emission of North China Grid (tCO ₂ e)							757,552,268				

Data source: China Energy Statistical Yearbook 2008.

Based on the data provided in Table A1~Table A6, the operating margin emission factor of North China Grid is calculated as 1.0069 tCO₂e/MWh.



Table A7. Data and results of Step a.

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Total Fuel G=A+B+...+F	Emission factor (kgCO ₂ /TJ) H	NCV (MJ/t or 1000m ³) I	CO ₂ emission ²² (tCO ₂ e) J
Coal	10 ⁴ t	816.17	1,753.99	7,716.13	7,510.06	11,884.83	10,434.30	40,115.43	87,300	20,908	732,214,267
Cleaned coal	10 ⁴ t	0	0	0	0	18.43	0	18.43	87,300	26,344	423,859
Other washed coal	10 ⁴ t	5.76	0	156.89	478.81	756.84	48.57	1,446.87	87,300	8,363	10,563,452
Mould coal	10 ⁴ t	7.93	0	0	0	42.86	0	50.79	87,300	20,908	927,054
Coke	10 ⁴ t	0	0	0.02	0	4.09	0	4.11	95,700	28,435	111,843
Other coking products	10 ⁴ t	4.74	0	0	0	0	0	4.74	95,700	28,435	128,986
Sub-total											744,369,461
Crude oil	10 ⁴ t	0	0	0	0	0	0	0	71,100	41,816	0
Gasoline	10 ⁴ t	0	0	0.01	0	0	0	0.01	67,500	43,070	291
Diesel	10 ⁴ t	0.33	0	2.35	0	5.08	0.62	8.38	72,600	42,652	259,490
Fuel oil	10 ⁴ t	4.74	0	0.18	0	2.35	0	7.27	75,500	41,816	229,522
Other petroleum products	10 ⁴ t	1.72	0	0	0	0	0	1.72	75,500	41,816	54,302
Sub-total											543,604
Natural gas	10 ⁷ m ³	50.3	7.3	0	5.4	0.1	42.2	105.3	54,300	38,931	2,225,993
Coke oven gas	10 ⁷ m ³	0.7	7.2	31.3	254.6	136.1	25.8	455.7	37,300	16,726	2,843,020
Other gas	10 ⁷ m ³	118	76	883.8	728	296.4	281.7	2,383.90	37,300	5,227	4,647,821
Liquefied petroleum gases	10 ⁴ t	0	0	0	0	0	0	0	61,600	50,179	0
Refinery gas	10 ⁴ t	0.06	0	2.85	0	1.65	0	4.56	48,200	46,055	101,225
Sub-total											9,818,059
Total											754,731,124

Data source: China Energy Statistical Yearbook 2008.

Calculated with the data provided in Table A7 and formula (5)~(7), the value of λ_{Coal} is 98.63%, the value of λ_{Oil} is 0.07% and the value of λ_{Gas} is 1.30%.

Therefore, $EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} = 0.8191 \text{ tCO}_2\text{e/MWh}$.

²² J=G×H×I/10⁵.



Table A8. Installed capacity of North China Grid in 2007

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power (MW)	3,900	6,920	29,020	30,950	39,870	54,140	164,800
Hydro power (MW)	1,050	10	780	790	830	1,050	4,510
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Others (MW)	2.7	0	410	0	1,096.50	210	1,719.20
Total (MW)	4,952.70	6,930	30,210	31,740	41,796.50	55,400	171,029.20

Data source: China Electric Power Yearbook 2008.

Table A9. Installed capacity of North China Grid in 2006

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power (MW)	3,984	6,512	26,087	26,661	28,899	49,395	141,538
Hydro power (MW)	1,053	5	785	790	818	553	4,004
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Others (MW)	24	24	218	0	565	106	937
Total (MW)	5,061	6,541	27,090	27,451	30,282	50,054	146,479

Data source: China Electric Power Yearbook 2007.

Table A10. Installed capacity of North China Grid in 2005

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power (MW)	3,833.5	6,149.9	22,333.2	22,246.8	19,173.3	37,332	111,068.7
Hydro power (MW)	1025	5	784.5	783	567.9	50.8	3,216.2
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Others (MW)	24	24	48	0	208.9	30.6	335.5
Total (MW)	4,882.5	6,178.9	23,165.7	23,029.8	19,950.2	37,413.4	114,620.4

Data source: China Electric Power Yearbook 2006.



Table A11. Calculation of the build margin emission factor of North China Grid

	Installed capacity in 2005 (MW) A	Installed capacity in 2006 (MW) B	Installed capacity in 2007 (MW) C	Capacity additions from 2005 to 2007 (MW) D=C-A	Share in total capacity additions
Thermal power	10	141,538	164,800	53,731.30	95.25%
Hydro power	3,216.20	4,004	4,510	1,293.80	2.29%
Nuclear power	0	0	0	0	0.00%
Wind power and Others	335.5	937	1,719.20	1,383.70	2.45%
Total	114,620.40	146,479	171,029.20	56,408.80	100.00%
Share in the total installed capacity of 2007	67.02%	85.65%	100%		

Therefore, $EF_{grid,BM,y} = 0.8191 \times 95.25\% = 0.7802 \text{ tCO}_2\text{e/MWh}$.



Annex 4

MONITORING INFORMATION

No other additional information.