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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Liaoning Qujiagou Wind Farm Project
Version number of the document: 03
Date: 21/07/2010

The version history of the PDD is summarized as below.

Version number of the document	Date	Purpose and/or main revision
01	26/06/2009	Prepared for and submitted to China's DNA to apply LoA
02	06/11/2009	Prepared for and submitted to the DOE for public comments
03	21/07/2010	Revised based on the validation protocol

A.2. Description of the project activity:

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Liaoning Qujiagou Wind Farm Project (hereinafter referred to as the Project) is a newly built wind farm sited within Houxinqiu Town, Zhangwu County, Fuxin City, Liaoning Province, P.R.China. It is invested, constructed and operated by Fuxin Shenhua Xiehe Wind Power Co., Ltd..

The total installed capacity of the Project is 49.5 MW equipped with 33 sets of wind turbines with a unit capacity of 1,500 kW. The estimated electricity delivered to Northeast China Grid by the Project is 103,346 MWh per year and the average annual operating hours is 2,088 h with a power load factor of 0.238[1]. Electricity generated by the Project will be delivered to Northeast China Grid via the Step-up substation at the Project Site.

Northeast China Grid is dominated by thermal power plants. In the absence of the Project, equivalent amount of annual power output will be generated and supplied by Northeast 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 106,242 tCO_2e per year by avoiding CO_2 emissions from the same amount of electricity generation from Northeast 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,

1 Page 95 of the Feasibility Study Report (hereinafter referred to as the FSR). The FSR of the Project was finalized by Liaoning Electric Power Design Institute, which is a third party.

compared to a business-as-usual scenario;
- creating 20 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)	Fuxin Shenhua Xiehe Wind Power Co., Ltd. (the Project Owner)	No
Netherlands	Energy Systems International B.V.	No

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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Liaoning Province

A.4.1.3. City/Town/Community etc:
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Houxinqiu Town, Zhangwu County, Fuxin 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 sited about 3 km southeast to the downtown of Houxinqiu Town, Zhangwu County, Fuxin City, Liaoning Province, P.R.China. The center of the Project Site has geographical coordinates with east longitude of 122°50′01″ and north latitude of 42°34′43″. The area of the wind farm is 14 km^2. Figure 1 shows the location of Fuxin City, Figure 2 shows the location of the Project.

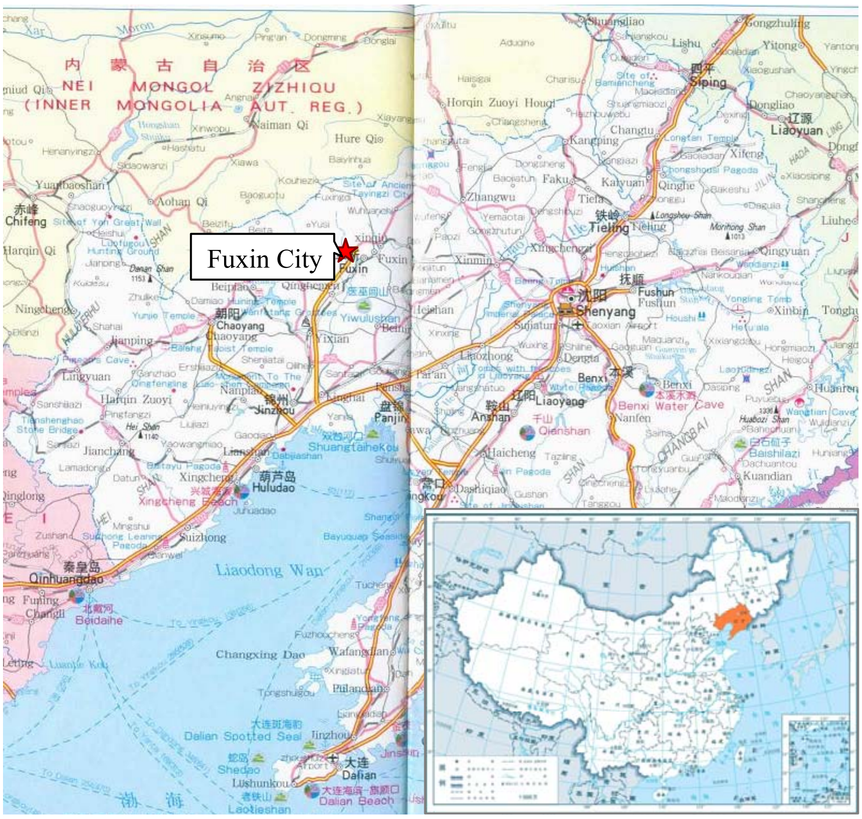

Figure 1 Location of Fuxin City

Figure 2 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 will be generated and supplied by Northeast 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 CO_2 emissions from the same amount of electricity generation from Northeast 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. Thus it is suitable to build grid-connected wind power generation projects at the Project Site.

The total installed capacity of the Project is 49.5 MW equipped with 33 sets of Type SL1500/77 turbines with a unit capacity of 1,500 kW. The estimated electricity delivered to Northeast China Grid by the Project is 103,346 MWh per year and the average annual operating hours is 2,088 h with a power load factor of 0.238[2]. Electricity generated by the Project will be delivered to Northeast China Grid via the Step-up substation at the Project Site.

Table 1 Main technical parameters of key equipments in the Project

Equipment	Quantity	Main Parameters	Source
Turbine	33 sets	Type: SL1500/77 Rated power: 1500 kW Quantity of blades: 3 Rotor diameter: 77.4 m Lifetime: 20 yrs[3]	Purchase Contract & Maintenance Manual
35 kV packaged substation	33 sets	Type: 35/1600kVA	Purchase Contract

The Project employs turbines manufactured by Sinovel Wind Co., Ltd. that involves no technology transfer from abroad.

Electricity delivered to Northeast China Grid by the Project will be monitored with electricity meters installed at the Step-up substation at the Project Site. The measurement precision of the electricity meters employed by the Project will be at least 0.5s.

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

2 Page 95 of the FSR. The FSR of the Project was finalized by Liaoning Electric Power Design Institute, which is a third party.

3 Page 89 of the FSR. The value is further confirmed by the manufacturer of turbines, Sinovel Wind Co., Ltd., in its *Maintenance and Repair Manual for SL1500 Wind Power Units*.

emission reductions of about 743,694 tCO_2e over the first 7-year crediting period from January 1, 2011 to December 31, 2017.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2011	106,242
2012	106,242
2013	106,242
2014	106,242
2015	106,242
2016	106,242
2017	106,242
Total estimated reductions (tonnes of CO_2e)	**743,694**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**106,242**

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 methodology

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

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Approved consolidated baseline and monitoring methodology ACM0002 (version 11): *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).

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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The Project is a grid-connected renewable 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. Therefore the Project applies the methodology ACM0002 approved by EB to determine the project baseline and calculate emission reductions achieved by wind power generation.

The Project meets the applicability conditions of the methodology ACM0002 as the Project is the installation of a wind power plant.

The Project involves no fossil fuel switching. According to the methodology ACM0002, the emission factor of the electricity system is determined by using *Tool to Calculate the Emission Factor for an Electricity System*, and the additionality of the Project is demonstrated and assessed by using *Tool for the Demonstration and Assessment of Additionality*.

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 Northeast China Grid that the Project is connected to.

The project power plant includes the main control room, the multipurpose building, 33 sets of wind turbines with a unit capacity of 1,500 kW and relevant auxiliaries.

Electricity generated by the Project will be delivered to Northeast 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 grid boundaries, Northeast China Grid is the grid boundary of the Project. Northeast China Grid is composed of Heilongjiang Power Grid, Jilin Power Grid and Liaoning 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 Heilongjiang Power Grid, Jilin Power Grid and Liaoning Power Grid.

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

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation of Northeast China Grid.	CO_2	Yes	Main emission sources.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project activity	CO_2 emissions of the Project.	CO_2	No	The Project is a wind farm project, excluded as per the methodology ACM0002.
		CH_4	No	The Project is a wind farm project, excluded as per the methodology ACM0002.
		N_2O	No	The Project is a wind farm project, excluded as per the methodology ACM0002.

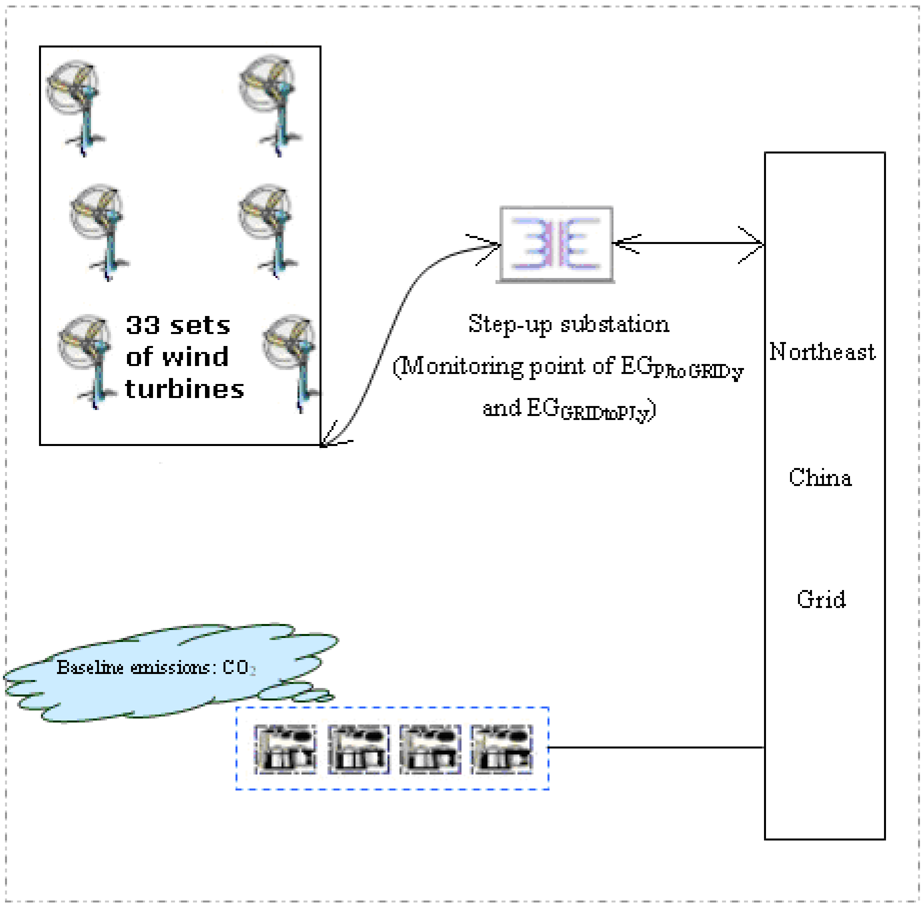

Figure 3 The Project Boundary and relevant emission sources

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 delivered 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 delivers electricity to Northeast China Grid.

According to the methodology ACM0002, the baseline scenario of the Project is "electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in *Tool to calculate the emission factor for an electricity system*". According to *Tool to calculate the emission factor for an electricity system*, "if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, the delineation should be used".

According to *Tool to Calculate the Emission Factor for an Electricity System*, the delineation of grid boundaries of the Project is Northeast China Grid.

Therefore according to the methodology ACM0002, the baseline scenario of the Project is "the provision of an equivalent amount of annual power output by Northeast 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* approved by EB.

The Project started on July 20, 2008. As summarized in Table 3, CDM was seriously considered in the decision to implement the Project.

Table 3 Project Schedule

Timeline	Progress
June 2008	The FSR of the Project. Owing to the investment barrier faced by the Project, the Project Owner had taken CDM revenues into consideration in the investment analysis in the FSR.
July 1, 2008	Outcome of board of directors' meeting shows that it is decided to implement the Project after taking CDM revenues into consideration.
July 16, 2008	*Emission Reduction Purchase Agreement* and *CDM Consulting Contract*
July 20, 2008	*Equipment Purchase Contract*
August 20, 2008	*Civil Engineering Contract*
December 3, 2008	*Order to Commence* was issued and construction of the Project was started.
January 2009 ~ June 2009	Necessary information and documents for CDM development of the Project were collected and the PDD of the Project was compiled.
Jun 6, 2009	The Project Owner submitted the application for the LOA of China's DNA.[4]
September 22, 2009	The Project Owner got the LOA of China's DNA.[5]
November 30, 2009	The PDD was publicly available on UNFCCC's website.[6]

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 scenarios 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 scenarios available to the Project that provide outputs or services comparable to the proposed CDM project activity include:
Baseline scenario I: Construction of a thermal power plant with an equivalent amount of annual electricity generation;
Baseline scenario II: The Project undertaken without being registered as a CDM project activity;
Baseline scenario III: Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity generation; and
Baseline scenario IV: Provision of an equivalent amount of annual power output by Northeast China Grid which the Project is connected to.

Fuxin City, where the Project is sited, is in great shortage of water resource, so there is no economically exploitable water resource[7]. Biomass generation technology is still in the demonstration phase and can bring only poor economic benefits, which can't be operated without support from the national policies[8] . For solar PV, considering the same annual electricity generation as the Project (49.5 MW), the baseline scenario of the Project should be a solar PV farm with an installed capacity of about 49.5 MW. Since the largest solar PV projects that had started construction in China are one project with the installed capacity of only 8 MW in 2006 and another project with the installed capacity of only 20 MW in 2010, it is not feasible to construct a solar PV farm instead of the Project[9]. Therefore, Baseline scenario III is not feasible.

4 The application form submitted to China's DNA for LOA.
5 The LOA of the Project issued by China's DNA.
6 Http://cdm.unfccc.int/Projects/Validation/DB/I0IVB01YU2PRSFX1F2024VEZUA72WB/view.html.
7 Http://www.studa.net/shuili/060217/0959281.html.
8 Http://jjckb.xinhuanet.com/cjxw/2007-11/27/content_75467.htm.
9 Http://www.cec.org.cn/html/news/2009/3/16/2009316942277369.html,
http://www.chinadaily.com.cn/dfpd/yunnan/2010-05-26/content_365531.html.

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

For Baseline scenario I, the installed capacity of the Project is 49.5 MW, considering the same annual electricity generation, the baseline scenario of the Project should be a thermal power plant with an installed capacity not more than 49.5 MW. However, according to China's regulations, construction of thermal power plants with the installed unit capacity of 135 MW or below is prohibited in areas where can be covered by large grids such as provincial grids[10]. Therefore, Baseline scenario I is not feasible.

For Baseline scenario 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 scenario IV, provision of an equivalent amount of annual power output by Northeast 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.

Based on analysis in Step 1, Senario I and Senario III are excluded. Further analysis on Senario II and Senario IV is shown in Step 2. The conclusion is that the practical and feasible baseline scenario is Senario IV.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

Tool for the Demonstration and Assessment of Additionality 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 project 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,* the benchmark project IRR (after tax) adopted by the Project is 8%. 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

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 Liaoning Electric Power Design Institute, and approved by Liaoning Development and Reform Commission. Liaoning Electric Power Design Institute is a qualified organization which has qualification Level I in design of electric power engineering. Therefore the FSR is a reliable data source for investment analysis. According to the FSR,

10 *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.

the basic parameters and assumptions for calculation of the IRR (after tax) of the Project are summarized below.

Installed capacity	49.5	MW
Supplied electricity	103,346	MWh
Construction period	1	year
Operation period	20	year
Total project cost	46,250.00	10000RMB
Working capital	123.75	10000RMB
Tariff (including VAT)	0.61	RMB/kWh
Interest during construction period	1,197.68	10000RMB
Equity	15,658.00	10000RMB
Long-term loan	30,592.00	10000RMB
Debt-equity ratio	66:34	
Interest of long-term loan	7.83	%
Repayment period (excluding one year of construction)	9	year
Working capital loan	123.75	10000RMB
Interest of working capital loan	7.47	%
O&M expenses	1,383.33	10000RMB
Salary and welfare of employees	157.00	10000RMB
Maintenance	712.72	10000RMB
Materials	198.00	10000RMB
Miscellaneous	198.00	10000RMB
Insurance	118.62	10000RMB
VAT	8.50	%
Income tax	25	%
Urban maintenance and construction tax	5	%
Surtax for education	3	%
Depreciation rate	7	%
Residue value	5	%
Expected CER price	11	EURO/tCO_2e
Crediting period	7yrs×3	

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

In accordance with the benchmark analysis (Option III), if the 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 CERs revenues, the IRR (after tax) is 6.45%, which is lower than that of the benchmark (8%) of power sector. Therefore, the Project is not financially attractive.

Sub-step 2d. Sensitivity analysis

According to *Guidance on the Assessment of Investment Analysis (ver 03.1)*[11], the "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". Furthermore, the O&M cost is a variable which constitute less than 20% have a material impact on the analysis. Therefore, the following financial indicators of the Project were taken as uncertain factors for sensitive analysis of financial attractiveness:

- Total project cost
- O&M expenses
- Supplied electricity
- Tariff (including VAT)

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

Table 4 Results of sensitivity analysis
(without CERs revenues)

Range / Parameter	-10%	-5%	0	+5%	+10%
Total project cost (%)	7.95	7.17	6.45	5.78	5.13
O&M expenses (%)	6.82	6.64	6.45	6.26	6.08
Supplied electricity (%)	4.83	5.66	6.45	7.21	7.95
Tariff (including VAT, %)	4.83	5.66	6.45	7.21	7.95

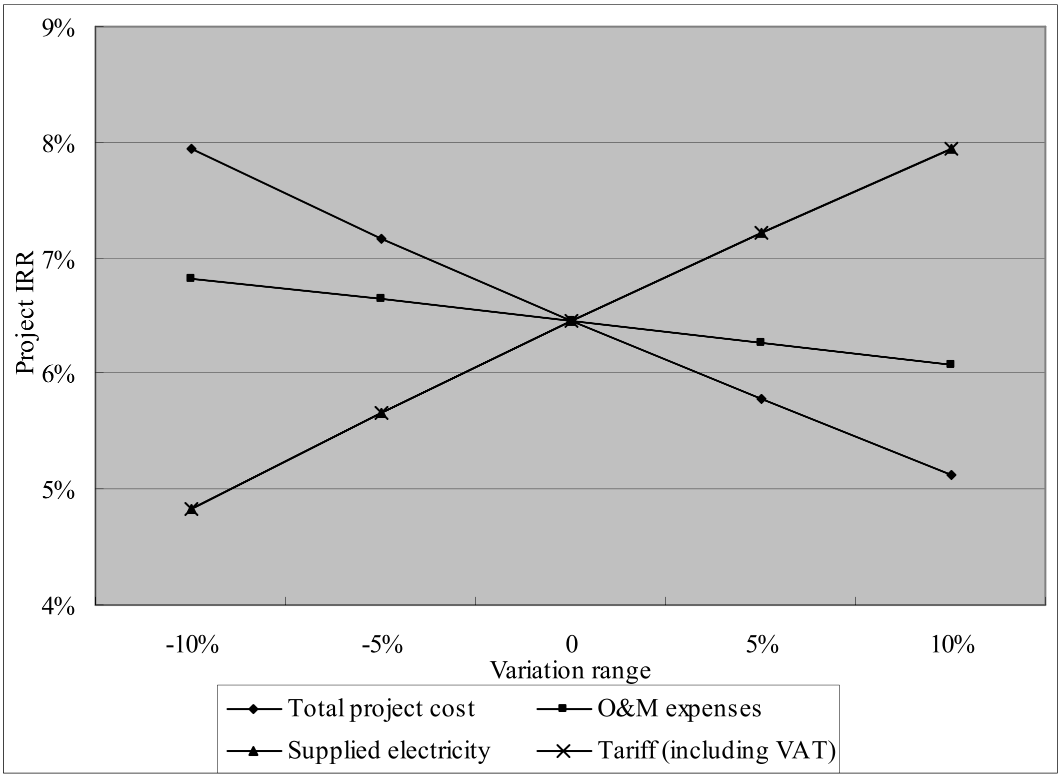

Figure 4 Results of sensitivity analysis
(without CERs revenues)

Based on the sensitivity analysis, the IRR (after tax) of the Project could reach the benchmark if one of

[11] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

the following conditions can be achieved:

- The total project cost were decreased by at least 10.30%;
- The O&M expenses were decreased by at least 43.10%;
- The tariff (including VAT) were increased by at least 10.35%;
- The supplied electricity were increased by at least 10.35%.

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

·Regarding the total project cost

The FSR of the Project has been finalized by Liaoning Electric Power Design Institute. Liaoning Electric Power Design Institute is a qualified organization which has qualification Level I in design of electric power engineering. So the FSR compiled by Liaoning Electric Power Design Institute provides reliable assessment on the total project cost of the Project and the data were used in the investment analysis. Since the cost of materials and labours keeps increasing in recent years[12], and the total value of already signed contracts of main equipments and engineering accounts more than 93% of the total project cost estimated in the FSR, it is impossible to decrease the total project cost by 10.30%.

·Regarding the O&M expenses

As shown in Figure 4, impact of fluctuation of O&M expenses on the IRR (after tax) is not significant. Value of the O&M expenses of the Project is obtained from the FSR of the Project. The FSR of the Project is a reliable data source for it is compiled by Liaoning Electric Power Design Institute guided by *Announcement for Economic Evaluation Method and Parameters for Construction Projects* published by National Development and Reform Commission and Ministry of Housing and Urban-Rural Development of the People's Republic of China, and *Compilation Methods for Feasibility Study Reports of Wind Farm Projects* published by National Development and Reform Commission. As summarized in Table Step 2c above, 77% of the O&M expenses are salary and welfare of employees, maintenance and materials. Since the cost of materials and labours keeps increasing in recent years[13], it is impossible to decrease the O&M expenses as much as 43.10%.

·Regarding the tariff (including VAT)

The FSR of the Project was compiled in June 2008 and the investment decision of the Project was made in July 2008. On November 26, 2009, the tariff of the Project was approved by Price Control Administration of Liaoning Province as 0.61 Yuan/kWh (including VAT)[14]. There are four tariff documents for wind power projects issued after November 11, 2001, Document No. FaGaiJiaGe[2003]424, Document No. FaGaiJiaGe[2007]3303, Document No. FaGaiJiaGe[2008]1876 and Document No. FaGaiJiaGe[2009]1906. According to these four tariff policies, the highest tariff of wind power projects in Liaoning Province is 0.61 RMB/kWh (including VAT).

As analyzed above, the tariff employed in the PDD (0.61 RMB/kWh (including VAT)) is consistent with the tariff (including VAT) adopted in the FSR, the tariff approval issued by Price Control Administration of the Project and the regulated tariff for wind power projects in Liaoning Province, thus impossible to be increased by 10.35%.

·Regarding the supplied electricity

12 Http://www.zh818.com/Get/gangshi/20098108260.html.

13 Http://www.zh818.com/Get/gangshi/20098108260.html,
4-23 and 8-15 in http://www.stats.gov.cn/tjsj/ndsj/2008/indexch.htm.

14 The tariff approval of the Project by Price Control Administration of Liaoning Province.

The supplied electricity in the FSR is estimated based on turbine power curve, position of installation and 30 years of local meteorological data etc. The selected design is the best one in four alternatives that could fit local wind resources. Therefore, it is impossible to increase the supplied electricity by 10.35% throughout the lifetime of the Project.

As shown in the sensitivity analysis above, the variation range of the uncertain factors could not increase the IRR (after tax) to reach the benchmark. Therefore the conclusion regarding the financial/economic attractiveness of the Project that it is unlikely to be financially/economically attractive is robust to reasonable variations in the critical assumptions.

If the Project can be successfully registered as a CDM project, the CERs revenues will significantly improve the IRR (after tax). Considering the CERs revenues (calculated with EURO 11/tCO_2e, 7 yrs×3 crediting period), the IRR (after tax) of the Project will be significantly improved to reach the benchmark, as shown in Table 5.

Table 5 Comparison of the IRR (after tax) with and without CERs revenues

	the Project	**the benchmark**
Without CERs revenues (%)	6.45	8
With CERs revenues (%)	9.55	8

It is shown in Table 5 that the CERs 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 Project is a newly built wind farm with an installed capacity of 49.5 MW located in Liaoning Province. The Project is approved by the provincial government, and the tariffs are government guidance pricing which vary in different provinces. 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.

Therefore activities similar to the Project should be wind farms located in Liaoning Province with an installed capacity larger than 15 MW, with respect to similar technology and similar regulatory framework with a starting date of construction later than January 1, 2002[15].

15 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

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 excluded from the analysis. All the wind farms located in Liaoning Province with an installed capacity larger than 15 MW and with a starting date of construction later than January 1, 2002 have been started validation or registered as CDM projects, so they will not be taken into consideration under common practice analysis. Therefore no similar activities identified with such criteria[24].

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

No project activity similar to the Project is identified in Liaoning Province. The fact demonstrates that the Project does not belong to common practice and fulfils the requirement of additionality.

To summarize, "the Project is undertaken without being registered as a CDM project activity" is not financially attractive to investors, thus is not feasible. Being registered as a CDM project, the CERs 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

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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).
24 *Installed Capacity of Wind Farms in China in 2007*, by Mr. Shi Pengfei, Vice Chairman of Chinese Wind Association (http://www.cwea.org.cn/download/display_info.asp?id=25).

The Project is a wind power project and no project emissions should be considered as per the methodology ACM0002, i.e., $PE_y = 0$ tCO_2e.

II. Calculate the baseline emissions

As per the methodology ACM0002, baseline emissions include only CO_2 emissions from electricity generation in Northeast 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 (tCO_2e);

$EG_{PJ,y}$ 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 CO_2 emission factor for grid connected power generation in year y calculated using the latest version of *Tool to Calculate the Emission Factor for an Electricity System* (tCO_2e/MWh).

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

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 activity, so:

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

$$EG_{facility,y} = EG_{PJtoGRID,y} - EG_{GRIDtoPJ,y} \quad (3)$$

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).

$EG_{PJtoGRID,y}$ is the electricity supplied by the Project to the grid in year y (MWh);

$EG_{GRIDtoPJ,y}$ is the electricity imported by the Project from the grid in year y (MWh).

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

The baseline emissions is the result of the baseline emission factor ($EF_{grid,CM,y}$) times the electricity delivered to the grid by the Project. The baseline emission factor is determined ex ante by using *Tool to Calculate the Emission Factor for an Electricity System* according to following steps: Calculation of the emission factor of Northeast China Grid, the electricity system identified for the Project, is divided into seven steps as described below.

Step 1. Identify the relevant electricity system

In accordance with *Tool to Calculate the Emission Factor for an Electricity System*, the relevant electricity system of the Project is identified according to the delineation of the relevant electricity system

and connected electricity systems published by China's DNA.

Electricity generated by the Project will be delivered to Northeast China Grid. According to *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China* (published on July 2, 2009) issued by China's DNA which provides the delineation of relevant electricity systems, Liaoning Power Grid is an integral part of Northeast China Grid and Northeast China Grid is the relevant electricity system of the Project. Northeast China Grid is composed of Heilongjiang Power Grid, Jilin Power Grid and Liaoning Power Grid.

There is no net electricity import to Northeast China Grid, so it is not necessary to calculate the emission factor of 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) method

Four methods are provided in *Tool to Calculate the Emission Factor for an Electricity System* for the calculation of operating margin emission factor ($EF_{grid,OM,y}$), 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 hydropower production. Among the total electricity generation of Northeast China Grid which the Project is connected to, the amount of low-cost/must-run resources accounts for about 5% in 2003, 6% in 2004, 8% in 2005, 6% in 2006 and 5% in 2007, all less than 50%. Thus, the method (a) simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{grid,OM,y}$) for 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 CO_2 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.

Since the data on the net electricity generation and CO_2 emission factor of each power unit in Northeast China Grid are not available, Option A is not applicable to the Project. As summarized in Annex 3, there is no nuclear power generation installed in Northeast China Grid thus 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. Moreover, off-grid power plants are not included in the calculation (Option I has been chosen in Step 2). 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 ($EF_{grid,OMsimple,y}$).Since the quantity of electricity supplied to the grid by these sources is obtained from *China Electric Power Yearbook*, Option C is applicable. The formula of $EF_{grid,OMsimple,y}$ calculation is

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (4)$$

$$EG_y = \sum_j GEN_{j,y} \times \left(1 - r_{j,y}\right) \qquad (4\text{-a})$$

Where:
$EF_{grid,OMsimple,y}$ is the simple operating margin emission factor in year y (tCO_2e/MWh);
$FC_{i,y}$ is the amount of fuel i consumed in Northeast 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 CO_2 emission factor of fuel i in year y (tCO_2e/GJ);
EG_y is the net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh);
i are all fuel types combusted in power sources in Northeast 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 Northeast China Grid in year y;
$r_{j,y}$ is auxiliary electricity consumption rate of province j of Northeast 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.

There exists no net electricity import to Northeast China Grid. 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 Northeast China Grid is 1.1293 tCO_2e/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 that 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 methodology[25]:
1) Use of capacity additions during the last several years for estimating the build margin emission factor for grid-connected 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*, one of the following two options to calculate the build margin emission factor ($EF_{grid,BM,y}$) shall be chosen.

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

25 Http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ.

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 (5):

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (5)$$

Where:
$EF_{grid,BM,y}$ is the build margin emission factor in year y (tCO_2e/MWh);
$EF_{EL,m,y}$ is the CO_2 emission factor of power unit m in year y (tCO_2e/MWh);
$EG_{m,y}$ is the net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh/yr);
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 3(a) (Simple OM) in *Tool to Calculate the Emission Factor for an Electricity System.*

The emission factor of unit m is calculated according to Option B2 in 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 formulae:

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.

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \qquad (6)$$

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

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (8)$$

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 CO_2 emission factor of fuel i in year y (tCO_2e/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.

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (9)$$

$$EF_{Coal,Adv,y} = FC_{adv,coal} \times NCV_{coal,y} \times EF_{CO2,coal,y} \quad (9\text{-a})$$

$$EF_{oil,Adv,y} = FC_{adv,oil} \times NCV_{oil,y} \times EF_{CO2,oil,y} \quad (9\text{-b})$$

$$EF_{gas,Adv,y} = FC_{adv,gas} \times NCV_{gas,y} \times EF_{CO2,gas,y} \quad (9\text{-c})$$

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.

$FC_{adv,coal}$, $FC_{adv,oil}$ and $FC_{adv,gas}$ are fuel consumption for power generation 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.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total.y}} \times EF_{Thermal,y} \quad (10)$$

$$CAP_{total,y} = \sum_{j} CAP_{j,y} \quad (10\text{-a})$$

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 Northeast China Grid in year y.

The data on installed capacity for calculating the build margin emission factor ($EF_{grid,BM,y}$) are obtained

from *China Electric Power Yearbook 2005/2006/2007/2008*. 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 emission factors of the fuels employed 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.

Referring to *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China* (published on July 2, 2009), the build margin emission factor ($EF_{grid,BM,y}$) of Northeast China Grid is 0.7242 tCO_2e/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

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times \omega_{OM} + EF_{grid,BM,y} \times \omega_{BM} \quad (11)$$

According to *Tool to Calculate the Emission Factor for an Electricity System*, the weight w_{OM} is 0.75 and the weight w_{BM} is 0.25 for wind power projects. Therefore the combined margin emission factor, i.e. the baseline emission factor of the Project,
$EF_{grid,CM,y}$ = 0.75 × 1.1293 + 0.25 × 0.7242 = 1.028025 (tCO_2e/MWh).

III. Calculate the leakage

According to the methodology ACM0002, the leakage of the Project is not considered.

IV. Calculate the emission reductions

The Project will generate emission reductions by avoiding CO_2 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:

$$ER_y = BE_y - PE_y \quad (12)$$

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 Northeast China Grid in year y
Source of data used:	*China Electric Power Yearbook* 2005, 2006 and 2008 edition
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 *China Electric Power Yearbook* 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 Northeast China Grid in year y
Source of data used:	*China Electric Power Yearbook* from 2006 to 2008
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 *China Electric Power Yearbook* 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 Northeast China Grid in year y
Source of data used:	*China Electric Power Yearbook* from 2006 to 2008
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 *China Electric Power Yearbook* 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 Northeast China Grid in year y
Source of data used:	*China Energy Statistical Yearbook* from 2006 to 2008
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 *China Energy Statistical Yearbook* 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 *China Energy Statistical Yearbook 2008*
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 *China Energy Statistical Yearbook* issued by authorized entity in China are reliable.
Any comment:	-

Data/Parameter:	$EF_{CO2,i,y}$
Data unit:	tC/TJ
Description:	CO_2 emission factor per unit of energy of fuel i in year y
Source of data used:	*2006 IPCC Guideline for National Greenhouse Gas Inventories*
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 *2006 IPCC Guideline for National Greenhouse Gas Inventories* are reliable.
Any comment:	-

Data/Parameter:	$FC_{adv,coal}$
Data unit:	gCe/kWh
Description:	Weighted average 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:	*Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China*
Value applied:	322.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China* made publicly available by China's DNA are reliable.
Any comment:	-

Data/Parameter:	$FC_{adv,oil/gas}$
Data unit:	gCe/kWh
Description:	Weighted average 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:	*Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China*
Value applied:	246
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China* 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., $PE_y = 0$ tCO_2e.

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

According to the FSR of the Project, the net electricity delivered by the Project to the grid is estimated to be 103,346 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 1.028025 tCO_2e/MWh and the annual baseline emissions of the Project are 106,242 tCO_2e.

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$ =103,346 × 1.028025 = 106,242 tCO_2e

III. Estimated leakage:

As per the methodology ACM0002, the leakage of the Project is not considered.

IV. Estimated emission reductions

As per formula (12), the annual emission reductions of the Project are 106,242 tCO_2e.

$ER_y = BE_y - PE_y$ = 106,242 – 0 = 106,242 tCO_2e

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 743,694 tCO_2e over the first 7-year crediting period from January 1, 2011 to December 31, 2017.

Year	**Estimation of project emissions (tonnes of CO_2e)**	**Estimation of baseline emissions (tonnes of CO_2e)**	**Estimation of leakage (tonnes of CO_2e)**	**Estimation of overall emission reductions (tonnes of CO_2e)**
2011	0	106,242	0	106,242
2012	0	106,242	0	106,242
2013	0	106,242	0	106,242
2014	0	106,242	0	106,242
2015	0	106,242	0	106,242
2016	0	106,242	0	106,242
2017	0	106,242	0	106,242
Total (tCO_2e)	**0**	**743,694**	**0**	**743,694**

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

B.7.1 Data and parameters monitored:

Data/Parameter:	$EG_{PJtoGRID,y}$
Data unit:	MWh
Description:	Electricity delivered 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	103,346
Description of measurement methods and procedures to be applied:	Continuously measured by the bidirectional meters (one main meter and one backup meter) installed at the Step-up substation at the Project Site and monthly recorded.
QA/QC procedures to be applied:	The backup meter will be used for monitoring when the main meter is malfunction. Receipt(s) is used for cross-check.
Any comment:	-

Data/Parameter:	$EG_{GRIDtoPJ,y}$
Data unit:	MWh
Description:	Electricity imported by the Project from the grid in year y
Source of data to be used:	Assumed as zero in the PDD. 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	0
Description of measurement methods and procedures to be applied:	Continuously measured by the bidirectional meters (one main meter and one backup meter) installed at the Step-up substation at the Project Site and monthly recorded.
QA/QC procedures to be applied:	The backup meter will be used for monitoring when the main meter is malfunction. Receipt(s) is used for cross-check.
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 electricity delivered by the Project to the grid ($EG_{PJtoGRID,y}$) and the electricity imported from the grid to the Project ($EG_{GRIDtoPJ,y}$) will be monitored.

2. Monitoring System Organization Chart

The monitoring system is shown in Figure 5 and implemented by the Project Owner.

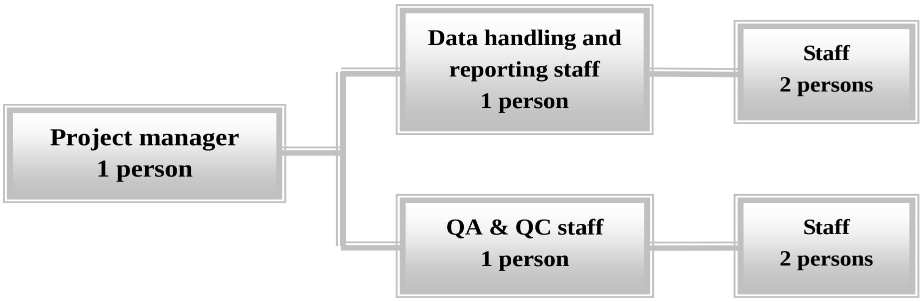

Figure 5 The monitoring system

The Project Manager is responsible for 1) implementation and supervision of the monitoring activity and 2) communication of this CDM project. The data handling and reporting personnel are responsible for managing, processing and submitting data. The QA & QC personnel are responsible for calibration of meters and supervision of the whole process quality.

3. Installation of Meters

The electricity delivered by the Project to the grid and the electricity delivered by the grid to the Project will be measured continuously by the bidirectional meter s (the main meter for usual monitoring and the backup meter for monitoring when the main meter's malfunction) installed at the Step-up substation at the Project Site and recorded monthly.

4. Precision of Meters

The meters of the Project will be equipped in line with national norms. The measurement precision of the meters employed by the Project will be at least 0.5s.

5. Calibration of Meters

The meters 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 all the parameters mentioned in the monitoring plan and archiving all the data.
·Data and documents related to the monitoring of the electricity will be kept for at least two years after the end of the last crediting period or two years after the last issuance of CERs.

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. If something unusual, the Project Manager should be immediately reported.

8. **Emergency Procedure**

The backup meter will be used for monitoring when the main meter is malfunction.

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 21/07/2010 by:

Person/entity	Project participate (Yes/No)
Tao PAN Tel: +86-13911049424 Email: Tao.Pan@Additional.cn	No
Energy Systems International 1202 Jinbao Office Building, 89 Jinbao Street, Dongcheng District, Beijing 100005, P.R.China Tel: +86-10-85221916 Fax: +86-10-85221906	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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20/07/2008 (*Equipment Purchase 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:

>>

01/01/2011 (or the registration date)

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 Environmental Impact Assessment Form was completed by Liaoning Academy of Environmental Sciences and approved by Liaoning Environment Protection Bureau on November 13, 2008 (Document No.LHSB[2008]74). According to the Environmental Impact Statement Form, environmental impacts possibly caused by the Project and corresponding measures adopted by the Project Owner are analyzed as follows:

Waste water

Almost no production waste water will be produced in the Project. The total 1,088 m^3 of domestic waste water produced during the construction period will be used as fertilizer after being treated with lime. During the operation period, domestic waste water generated in the Project (0.6 m^3/d) will be used as fertilizer after being treated in septic tanks. No waste water will be discharged in the Project. Therefore the Project will have little impact on the surroundings.

Dust and exhaust gas

There is almost no discharge of exhaust gas during the operation period of the Project. During the construction period of the Project, generation of dust reentrainment is mainly due to excavation, piling, backfilling and transportation of earth, land flatting, road expansion and transportation, loading and unloading and piling of construction materials. Exhaust gas will 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, air pollutant emission of the Project will meet the requirement of *Integrated Emission Standard of Air Pollutants* (GB16297-1996), so the Project will have little impact on the surroundings.

Noise

Noises generated during construction period of the Project include those stemming from the operation of construction machines and equipments and running of vehicles. The noises will also be generated by various engineering. After attenuation, the noises meet the requirement of *Noise Limits for Construction Site* (GB12523-90). During the operation period of the Project, noise will be generated mainly from operation of turbines. The Project Site is about 500 m far from local residents. After attenuation, the noises meet the requirement of Category I of *Standard of Environmental Noise of Urban Area* (GB3096-93).

Solid waste

The small amount of construction waste generated during the construction period will be reused as materials for land flatting and road expansion. Domestic garbage (about 27 t/a) generated during the construction period and domestic garbage (about 6 t/a) generated during the operation period will be collected and taken away periodically by the environmental sanitation administrative department. By taking the measures above, the solid waste discharged in the Project will not have any negative impact on the surroundings.

Ecological impact

The Project covers 9.22 hectares of wasteland, 2.94 hectares of cultivated slope land and 7.85 hectares of young forest land and open forest land. Damage to the vegetation caused by permanent land occupation of the Project will be compensated correspondingly. In other words, vegetation with equal area and quality to the damaged will be recovered in another place. By taking measures of vegetation recovery and compensation, the Project will have no impact on local ecological environment. The 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 affected by the Project. In December 2008, Liaoning Academy of Environmental Sciences conducted a survey on the stakeholders of the Project. The survey was conducted 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 51 questionnaires distributed to the stakeholders, 51 returned with a response rate of 100%. The basic structure of the respondents is illustrated in Table 6.

Table 6. Structure of the respondents

Structure of gender		
Gender	**No.**	**Percentage (%)**
Male	44	86
Female	7	14

Structure of occupation		
Occupation	**No.**	**Percentage (%)**
Farmer	42	82
Clerk	7	14
Leave Blank	2	4

Structure of age		
Age	**No.**	**Percentage (%)**
Below 30	3	6
30~40	16	31
40~50	19	37
50 above	13	25

Structure of education level		
Education level	**No.**	**Percentage (%)**
Primary school	10	20
Junior middle school	27	53
Senior middle school	12	24
Technical college or university	2	4

The questionnaire mainly focuses on the following issues:
•The extent that the stakeholders know about wind farms and wind power project.
•The attitude of the stakeholders on the construction of this project.
•The positive impacts that the stakeholders deem because of the project.
•The negative impacts that the stakeholders deem because of the project.
•The ways that the stakeholders think can reduce or even avoid the negative impacts.

E.2. Summary of the comments received:

>>

According to the 51 questionnaires received:
·51 respondents (100%) understand or have a very good understanding of the Project.
·48 respondents (94%) support the implementation of the Project and 3 respondents (6%) keep a neutral attitude.
·For the positive impacts caused by the implementation of the Project,

- 20% of the respondents think the Project could possibly reduce air pollution, while 80% of the respondents not clear.

- 20% of the respondents think the Project could possibly reduce electricity cost, while 80% of the respondents not clear.
- 69% of the respondents think the Project could possibly increase income, while 31% of the respondents not clear.
- 45% of the respondents think the Project could possibly increase employment opportunities, while 55% of the respondents not clear.
- 25% of the respondents think the Project could possibly improve life standard, while 75% of the respondents not clear.
- 2% of the respondents think the Project could possibly increase tourism, while 98% of the respondents not clear.

·For the negative impacts caused by the implementation of the Project,

- 69% of the respondents think the Project may increase noise, while 31% of the respondents don't think so.

None of the respondents raised any other positive or negative impact possibly caused by the implementation of the Project.

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

>>

It is known from the results of questionnaire statistics that all the stakeholders understand and support the construction of the Project.

The issue such as noise has been analyzed in Section D.1 of the PDD. The Project Owner will take environmental protection measures to ensure that there would be no such negative impact on local environment.

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

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 from Annex I Parties for the Project.

Annex 3

BASELINE INFORMATION

To determine the simple operating margin emission factor and the build margin emission factor for the Project, data recommended in *Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China* issued on July 2, 2009 for Northeast 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 electricity generation of Northeast China Grid in 2005

	Electricity generation (MWh)	**Auxiliary electricity consumption (%)**	**Electricity delivered to the grid (MWh)**
Liaoning	83,697,000	7.03	77,813,101
Jilin	35,294,000	6.59	32,968,125
Heilongjiang	58,000,000	7.96	53,383,200
Total			164,164,426

Data source: China Electric Power Yearbook 2006.

Table A2 Thermal electricity generation of Northeast China Grid in 2006

	Electricity generation (MWh)	**Auxiliary electricity consumption (%)**	**Electricity delivered to the grid (MWh)**
Liaoning	96,282,000	6.62	89,908,132
Jilin	38,576,000	6.78	35,960,547
Heilongjiang	62,964,000	7.85	58,021,326
Total			183,890,005

Data source: China Electric Power Yearbook 2007.

Table A3 Thermal electricity generation of Northeast China Grid in 2007

	Electricity generation (MWh)	**Auxiliary electricity consumption (%)**	**Electricity delivered to the grid (MWh)**
Liaoning	106,500,000	7	99,045,000
Jilin	43,700,000	7.68	40,343,840
Heilongjiang	68,400,000	7.67	63,153,720
Total			202,542,560

Data source: China Electric Power Yearbook 2008.

Table A4 Basic statistics of thermal power plants of Northeast China Grid in 2005

Fuel	**Unit**	**Liaoning A**	**Jilin B**	**Heilongjiang C**	**Total Fuel G=A+B+ C**	**Emission factor ($kgCO_2/TJ$) H**	**NCV (MJ/t or $1000m^3$) I**	**Emission (tCO_2e)[26] J**
Coal	10^4t	4,305.41	2,446.13	3,383.21	10,134.75	87,300	20,908	184,986,389
Cleaned coal	10^4t	0	0	0	0	87,300	26,344	0
Other washed coal	10^4t	524.74	19.26	24.16	568.16	87,300	8,363	4,148,079
Coke	10^4t	0	0	0	0	95,700	28,435	0
Coke oven gas	10^8m^3	1.03	3.57	0.68	5.28	37,300	16,726	329,409
Other gas	10^8m^3	12.62	8.37	0	20.99	37,300	5,227	409,236
Crude oil	10^4t	1.16	0	0	1.16	71,100	41,816	34,488
Gasoline	10^4t	0	0	0	0	67,500	43,070	0
Diesel	10^4t	1.18	1.48	0.57	3.23	72,600	42,652	100,018
Fuel oil	10^4t	9.32	2.46	1.55	13.33	75,500	41,816	420,842
Liquefied petroleum gases	10^4t	0.12	0	0	0.12	61,600	50,179	3,709
Refinery gas	10^4t	5.48	0	1.32	6.8	48,200	46,055	150,950
Natural gas	10^8m^3	0	0.84	2.24	3.08	54,300	38,931	651,098
Other petroleum products	10^4t	0	0	0	0	75,500	41,816	0
Other coking products	10^4t	0	0	0	0	95,700	28,435	0
Other energy	10^4tce	16.18	0	0	16.18	0	0	0
Total emissions of Northeast China Grid (tCO_2e)					191,234,218			

Data source: China Energy Statistical Yearbook 2006.

26 If the unit of the fuel is 10^4 t, then $J=G\times H\times I/10^5$; if the unit of the fuel is 10^8 m^3, then $J=G\times H\times I/10^4$. The same about the calculation of I in Table A5, Table A6 and Table A7.

Table A5 Basic statistics of thermal power plants of Northeast China Grid in 2006

Fuel	Unit	Liaoning A	Jilin B	Heilongjiang C	Total Fuel G=A+B+ C	Emission factor ($kgCO_2/TJ$) H	NCV (MJ/t or $1000m^3$) I	Emission (tCO_2e) J
Coal	10^4t	4,681.99	2,738.24	3,698.29	11,118.52	87,300	20,908	202,942,832
Cleaned coal	10^4t	0.03	0	0	0.03	87,300	26,344	690
Other washed coal	10^4t	674.74	17.83	96	788.57	87,300	8,363	5,757,270
Coke	10^4t	3.32	0	0	3.32	95,700	28,435	90,345
Coke oven gas	10^8m^3	2.68	0.16	1.44	4.28	37,300	16,726	267,021
Other gas	10^8m^3	55.26	1.43	0	56.69	37,300	5,227	1,105,268
Crude oil	10^4t	0.49	0	0	0.49	71,100	41,816	14,568
Gasoline	10^4t	0	0	0	0	67,500	43,070	0
Diesel	10^4t	0.75	0.39	0.3	1.44	72,600	42,652	44,590
Fuel oil	10^4t	11.73	0.45	1.44	13.62	75,500	41,816	429,998
Liquefied petroleum gases	10^4t	0	0	0	0	61,600	50,179	0
Refinery gas	10^4t	8.55	0	4.27	12.82	48,200	46,055	284,585
Natural gas	10^8m^3	0	0.19	2.1	2.29	54,300	38,931	484,095
Other petroleum products	10^4t	0	0	0	0	75,500	41,816	0
Other coking products	10^4t	0	0	0	0	95,700	28,435	0
Other energy	10^4tce	12.16	17.6	82.77	112.53	0	0	0
Total emissions of Northeast China Grid (tCO_2e)					211,421,263			

Data source: China Energy Statistical Yearbook 2007.

Table A6 Basic statistics of thermal power plants of Northeast China Grid in 2007

Fuel	**Unit**	**Liaoning** A	**Jilin** B	**Heilongjiang** C	**Total Fuel** G=A+B+ C	**Emission factor ($kgCO_2$/TJ)** H	**NCV (MJ/t or 1000m^3)** I	**Emission (tCO_2e)** J
Coal	10^4t	4,869.32	2,873.45	3,736.11	11,478.88	87,300	20,908	209,520,369
Cleaned coal	10^4t	0	0	0	0	87,300	26,344	0
Other washed coal	10^4t	747.85	16.52	106.81	871.18	87,300	8,363	6,360,397
Coke	10^4t	4.99	0	0	4.99	95,700	28,435	135,789
Coke oven gas	10^8m^3	5.53	1.44	1.89	8.86	37,300	16,726	552,758
Other gas	10^8m^3	68.38	9.06	0	77.44	37,300	5,227	1,509,825
Crude oil	10^4t	0.24	0	0	0.24	71,100	41,816	7,135
Gasoline	10^4t	0	0	0	0	67,500	43,070	0
Diesel	10^4t	0.96	0.39	0.47	1.82	72,600	42,652	56,357
Fuel oil	10^4t	8.43	0.45	1.48	10.36	75,500	41,816	327,076
Liquefied petroleum gases	10^4t	0	0	0	0	61,600	50,179	0
Refinery gas	10^4t	7.33	0	1.99	9.32	48,200	46,055	206,890
Natural gas	10^8m^3	0	0.02	2.03	2.05	54,300	38,931	433,360
Other petroleum products	10^4t	0.01	0	0	0.01	75,500	41,816	316
Other coking products	10^4t	0.46	0	0	0.46	95,700	28,435	12,518
Other energy	10^4tce	12.41	2.43	51.35	66.19	0	0	0
Total emissions of Northeast China Grid (tCO_2e)					219,122,791			

Data source: China Energy Statistical Yearbook 2008.

Calculated with the data provided in Table A1~A.6, the simple operating margin emission factor ($EF_{grid,OM,y}$) is calculated as the generation weighted average of 2005, 2006 and 2007. The value of the simple operating margin emission factor ($EF_{grid,OM,y}$) is 1.1293 tCO_2e/MWh.

Table A7 Data and results of Step a.

Fuel	Unit	Liaoning A	Jilin B	Heilongjiang C	Total Fuel G=A+B+ C	Emission factor ($kgCO_2/TJ$) H	NCV (MJ/t or $1000m^3$) I	Emission (tCO_2e) J
Coal	10^4t	4,869.32	2,873.45	3,736.11	11,478.88	87,300	20,908	209,520,369
Cleaned coal	10^4t	0	0	0	0	87,300	26,344	0
Other washed coal	10^4t	747.85	16.52	106.81	871.18	87,300	8,363	6,360,397
Mould coal	10^4t				0	87,300	20,908	0
Coke	10^4t	4.99	0	0	4.99	95,700	28,435	135,789
Other coking products	10^4t	0.46			0.46	95,700	28,435	12,518
Sub-total								**216,029,074**
Crude oil	10^4t	0.24	0	0	0.24	71,100	41,816	7,135
Gasoline	10^4t	0	0	0	0	67,500	43,070	0
Diesel	10^4t	0.96	0.39	0.47	1.82	72,600	42,652	56,357
Fuel oil	10^4t	8.43	0.45	1.48	10.36	75,500	41,816	327,076
Other petroleum products	10^4t	0.01	0	0	0.01	75,500	41,816	316
Sub-total								**390,885**
Natural gas	10^8m^3	0	0.2	20.3	20.5	54,300	38,931	433,360
Coke oven gas	10^8m^3	55.3	14.4	18.9	88.6	37,300	16,726	552,758
Other gas	10^8m^3	683.8	90.6	0	774.4	37,300	5,227	1,509,825
Liquefied petroleum gases	10^4t	0	0	0	0	61,600	50,179	0
Refinery gas	10^4t	7.33	0	1.99	9.32	48,200	46,055	206,890
Sub-total								**2,702,833**
Total								**219,122,791**

Data source: China Energy Statistical Yearbook 2007.

Table A8 Emission factor of the best technology

	Variable	Electricity supply efficiency	Emission factor of fuel (kgCO_2/TJ)	Emission factor (tCO_2/MWh)
		A	B	C=3.6/A/1000×B/1000
Coal fired power plants	$EF_{Coal,Adv}$	38.10%	87,300	0.8249
Gas fired power plants	$EF_{Gas,Adv}$	49.99%	54,300	0.3910
Oil fired power plants	$EF_{Oil,Adv}$	49.99%	75,500	0.5437

Data source: Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China

Calculated with the data provided in Table A7 and formulas (6)~(8), the value of λ_{Coal} is 98.59%, the value of λ_{Oil} is 0.18% and the value of λ_{Gas} is 1.23%. Therefore $EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ = 0.8191 tCO_2e/MWh.

Table A9 Installed capacity of Northeast China Grid in 2007

	Liaoning	Jilin	Heilongjiang	Total
Thermal power (MW)	19,720	7,580	14,080	41,380
Hydro power (MW)	1,410	3,890	870	6,170
Nuclear power (MW)	0	0	0	0
Wind power and Others (MW)	359	514	230	1,103
Total (MW)	21,489	11,984	15,180	48,653

Data source: China Electric Power Yearbook 2008.

Table A10 Installed capacity of Northeast China Grid in 2006

	Liaoning	Jilin	Heilongjiang	Total
Thermal power (MW)	16,721	7,039	12,456	36,216
Hydro power (MW)	1,401	3,872	853	6,126
Nuclear power (MW)	0	0	0	0
Wind power and Others (MW)	216	221	115	552
Total (MW)	18,338	11,132	13,424	42,894

Data source: China Electric Power Yearbook 2007.

Table A11 Installed capacity of Northeast China Grid in 2005

	Liaoning	Jilin	Heilongjiang	Total
Thermal power (MW)	15,999	6,359.4	11,575.6	33,934
Hydro power (MW)	1,403.9	3,720.8	846.7	5,971.4
Nuclear power (MW)	0	0	0	0
Wind power and Others (MW)	135.5	85.4	52.4	273.3
Total (MW)	17,538.4	10,165.6	12,474.7	40,178.7

Data source: China Electric Power Yearbook 2006.

Table A12 Installed capacity of Northeast China Grid in 2004

	Liaoning	Jilin	Heilongjiang	Total
Thermal power (MW)	14,960.3	5,958.7	11,259.1	32,178.1
Hydro power (MW)	1,404.1	3,601.2	844.6	5,849.9
Nuclear power (MW)	0	0	0	0
Wind power and Others (MW)	142	36.1	39.3	217.4
Total (MW)	16,506.4	9,596	12,143	38,245.4

Data source: China Electric Power Yearbook 2005.

Table A13 Calculation of generation capacity additions of Northeast China Grid

	Installed capacity in 2004 (MW) A	Installed capacity in 2005 (MW) B	Installed capacity in 2007 (MW) C	Capacity additions from 2004 to 2007 (MW) D=C- A	Share in total capacity additions
Thermal power	32,178.1	33,934	41,380	9,201.9	88.42%
Hydropower	5,849.9	5,971.4	6,170	320.1	3.08%
Nuclear power	0	0	0	0	0.00%
Wind power and Others	217.4	273.3	1,103	885.6	8.51%
Total	**38,245.4**	**40,178.7**	**48,653**	**10,407.6**	**100.00%**
Share in total installed capacity of 2007	78.61%	82.58%	100%		

Therefore, $EF_{grid,BM,y}$ = 0.8191×88.42%=0.7242 tCO_2e/MWh.

Annex 4

MONITORING INFORMATION

No more information.