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 Julonghu Wind Farm Project
Version number of the document: 02
Date: 15/09/2010

A.2. Description of the project activity:

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Liaoning Julonghu Wind Farm Project (hereinafter referred to as the Project) is located within Houxinqiu Town, Zhangwu County, Fuxin City, Liaoning Province, P.R.China. It is invested, constructed and operated by Fuxin Julonghu Wind Power Co., Ltd. (hereinafter referred to as the Project Owner).

The total installed capacity of the Project is 49.5 MW equipped with 33 sets of wind turbine with a unit installed capacity of 1,500 kW. The estimated electricity delivered to Northeast China Grid by the Project is 104,115 MWh per year with a plant load factor of 0.24[1]. Electricity generated by the Project will be delivered to Northeast China Grid.

Northeast China Grid is dominated by traditional thermal power plants. In the absence of the Project, equivalent amount of annual power output of the Project will be generated and supplied by Northeast China Grid which the Project is connected to, which is the same with the baseline scenario of the Project. It is expected that the Project as a renewable energy source power generation project will generate emission reductions of about 107,033 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, 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.

1 The Feasibility Study Report (hereinafter referred to as the FSR) of the Project. The plant load factor is determined by Shanxi Electric Power Exploration & Design Institute, which is a third party.

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 Julonghu Wind Power Co., Ltd. (the Project Owner)	No
Netherlands	Energy Systems International B.V.	No

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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Liaoning Province

A.4.1.3. City/Town/Community etc:

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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 located within Houxinqiu Town, Zhangwu County, Fuxin City, Liaoning Province, P.R.China. The geographical coordinates of the covered area of the Project are east longitude of 122°41′14″~122°46′07″ and north latitude of 42°31′30″~42°33′40″. The area of the wind farm is about 25 km^2. Figure 1 shows the location of Fuxin City. Figure 2 shows the location of the Project.

Figure 1. Location of Fuxin City

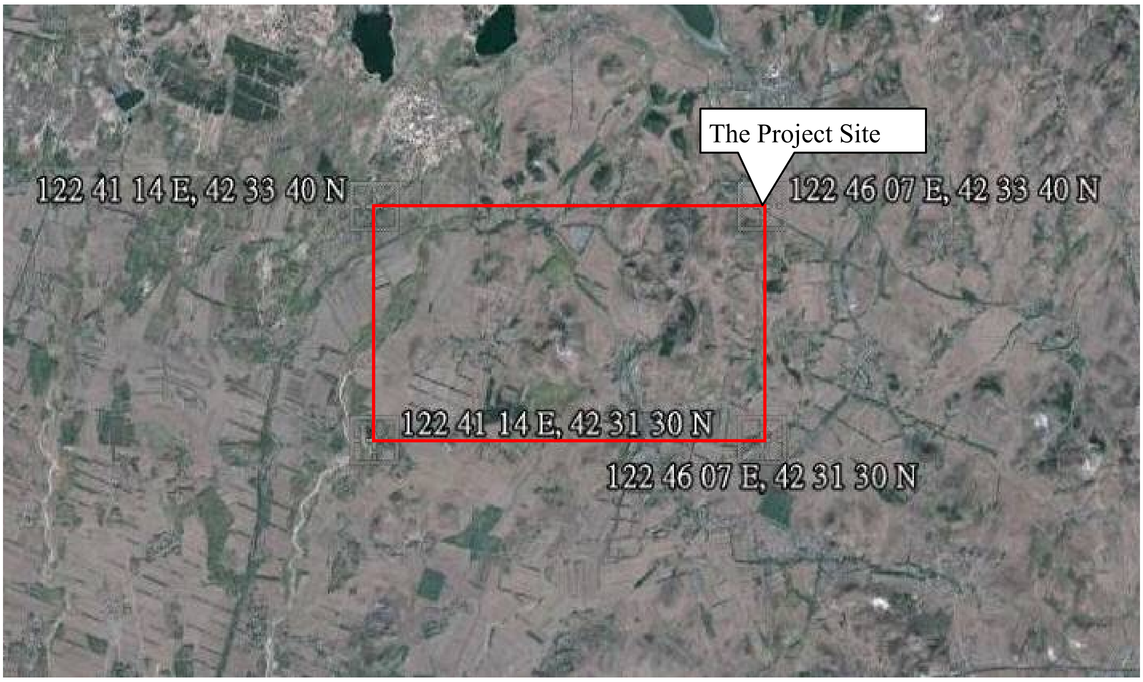

Figure 2. Location of the Project

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 of the Project will be generated and supplied by Northeast China Grid which the Project is connected to, which is the same with the baseline scenario of the Project. It is expected that the Project as a renewable energy source power generation project 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.

The total installed capacity of the Project is 49.5 MW equipped with 33 sets of wind turbines with a unit installed capacity of 1,500 kW. The estimated electricity delivered to Northeast China Grid by the Project is 104,115 MWh per year and the average annual operating hours is 2,103 h with a plant load factor of 0.24[2].

Table 1. Main technical parameters of turbines in the Project

Equipment	Quantity	Technical parameters	Data source
Turbine	33 sets	Type: FD82B Rated power: 1,500 kW Quantity of blades: 3 Rotor diameter: 82 m Lifetime: 20 yrs	*Turbine Purchase Agreement*
Main transformer	1 set	Type: SZ11-100000/220	*Main Transformer Purchase Agreement*

The Project employs turbines manufactured by Dongfang Turbine Co., Ltd., which involves no technology transfer from abroad.

Electricity delivered to Northeast China Grid by the Project will be monitored with two bidirectional meters (one main meter and one backup meter) installed at the low voltage side of the main transformer at the Project Site. The measurement precision of the 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 emission reductions of about 749,231 tCO_2e over the first 7-year crediting period from April 1, 2011 to March 31, 2018.

2 According to the FSR of the Project, the plant load factor is determined by Shanxi Electric Power Exploration & Design Institute, which is a third party.

Years	Annual estimation of emission reductions in tonnes of CO_2e
April to December, 2011	80,275
2012	107,033
2013	107,033
2014	107,033
2015	107,033
2016	107,033
2017	107,033
January to March, 2018	26,758
Total estimated reductions (tonnes of CO_2e)	**749,231**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**107,033**

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,

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 wind power plant at a site where no renewable power plant was operated prior to the implementation of the project activity. The Project does not involve switching from fossil fuels to renewable energy at the site. Therefore the Project applies the methodology ACM0002 which is approved by CDM EB to determine the project baseline and calculate emission reductions achieved by wind power generation.

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 installed capacity of 1,500 kW and relevant auxiliaries.

Electricity generated by the Project will be delivered to Northeast China Grid. According to *Notification on Determining Baseline Emission Factor of China's Grid* 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 Liaoning Power Grid, Jilin Power Grid and Heilongjiang 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 Northeast China Grid, which is composed of Liaoning Power Grid, Jilin Power Grid and Heilongjiang 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	Excluded as per the methodology ACM0002.
		CH_4	No	Excluded as per the methodology ACM0002.
		N_2O	No	Excluded as per the methodology ACM0002.

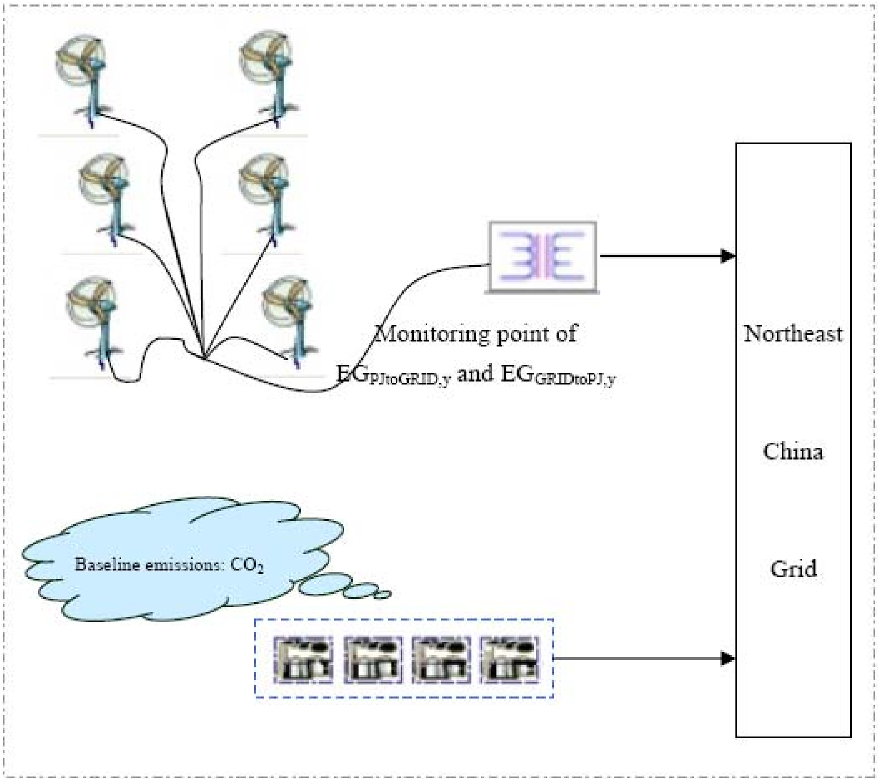

Figure 3. The Project Boundary and relevant emission sources

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*.

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". 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 *Notification on Determining Baseline Emission Factor of China's Grid* issued by China's DNA, the delineation of grid boundaries of the Project is Northeast China Grid.

Therefore, 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 CDM EB.

Civil Engineering Contract of the Project was signed on June 20, 2009, construction of the Project was started on June 26, 2009 and *Equipment Purchase Agreement* of the Project was signed on June 29, 2009. Therefore, the starting date of the Project is June 20, 2009 according to the definition of "the starting date of a CDM project activity" provided in paragraph 67 of EB41 meeting report. And PP also informed China's DNA and UNFCCC secretariat of the intention to implement CDM development of the Project on December 16, 2009 and December 17, 2009 respectively which are within six months of the Project starting date. Therefore, CDM was seriously considered in the decision to implement the Project.

Table 3. Project schedule

Timeline	Progress
February 2009	The FSR of the Project was finalized by Shanxi Electric Power Exploration & Design Institute. The project IRR in the FSR was lower than the benchmark (8%) of power sector and the Project was not financially attractive.
May 11, 2009	The Project Owner decided to go through the CDM process for the Project.
June 20, 2009	The Project Owner signed *Civil Engineering Contract.*
June 26, 2009	Construction of the Project was started.
June 29, 2009	The Project Owner signed *Equipment Purchase Agreement*.
September 29, 2009	The Project Owner signed *Emission Reductions Purchase Agreement*.
December 16~18, 2009	China's DNA was informed of the intention to implement CDM development of the Project on December 16, 2009 and confirmed the intention on December 18, 2009.
December 17, 2009	UNFCCC secretariat was informed of the intention to implement CDM development of the Project.
April 13, 2010	The Project Owner got the LOA from China's DNA.
June 13, 2010	The PDD was published on UNFCCC's website for public comments.

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[3]. Biomass generation technology and solar PV power generation technology are still in the demonstration phase[4] or initial stage[5] and can bring only poor economic benefits, which can't be operated without support from the national policies. Therefore, Baseline scenario III is not feasible.

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[6]. 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.

Therefore, further analysis only focuses on Baseline scenario II and Baseline scenario 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 IRR of the power sector is available.

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3 Http://www.ln.gov.cn/zfxx/qsgd/fxs/fxs1/200911/t20091102_438509.html.
4 Http://jjckb.xinhuanet.com/cjxw/2007-11/27/content_75467.htm,
http://waste.chinaep-tech.com/jieganfadian/23394.htm.
5 Http://www.tynw.net.cn/News/3/6099.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 [2002] No. 6 .

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

According to *Interim Rules on Economic Assessment of Electric Power Engineering Retrofit Projects*, the benchmark IRR adopted by the Project is 8% (the Project IRR post 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

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 Shanxi Electric Power Exploration & Design Institute and approved by Liaoning Development and Reform Commission. Shanxi Electric Power Exploration & Design Institute is a qualified organization which has qualification Level I in electric power engineering[7]. 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.

Supplied electricity	104,115	MWh
Construction period	1	year
Operation period	20	year
Total static investment	50,673.00	10,000RMB
Interest during construction period	998.56	10,000RMB
Working capital	148.50	10,000RMB
Debt-equity ratio	2:1	
Tariff (including VAT)	0.61	RMB/kWh
Interest rate of long-term loan	5.94	%
Interest rate of working capital loan	5.31	%
Employee	20	person
Salary	50,000	RMB
Social welfare	57	%
Maintenance rate	1.50	%
Insurance rate	0.25	%
Materials and Miscellaneous	60	RMB/kW
Total O&M expenses	1,261	10,000RMB/y
Depreciation period	15	year
Depreciation rate	6.33	%
Income tax	25	%
VAT[8]	17	%
Urban maintenance and construction tax	5	%
Surtax for education	3	%
Residual value rate	5	%

7 Http://baike.baidu.com/view/1870564.htm.

8 The value added tax for electricity generated by wind power projects is 17% as per *Provisional Regulations on Value Added Tax of the People's Republic of China*. Furthermore, according to the national regulation Cai Shui [2008] No.170, the input VAT from purchase of equipments can be used to deduct the output VAT from power sales revenues. Moreover, half of the VAT for power sales will be returned per the national regulation Cai shui [2008] No.156.

(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 6.40%, which is lower than that of the benchmark (8%) 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 static investment
- 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 CER revenues)

Parameter \ Range	-10%	-5%	0	+5%	+10%
Total static investment	7.76	7.07	6.40	5.76	5.16
O&M expenses	6.69	6.54	6.40	6.24	6.09
Supplied electricity	4.91	5.67	6.40	7.09	7.73
Tariff (including VAT)	4.91	5.67	6.40	7.09	7.73

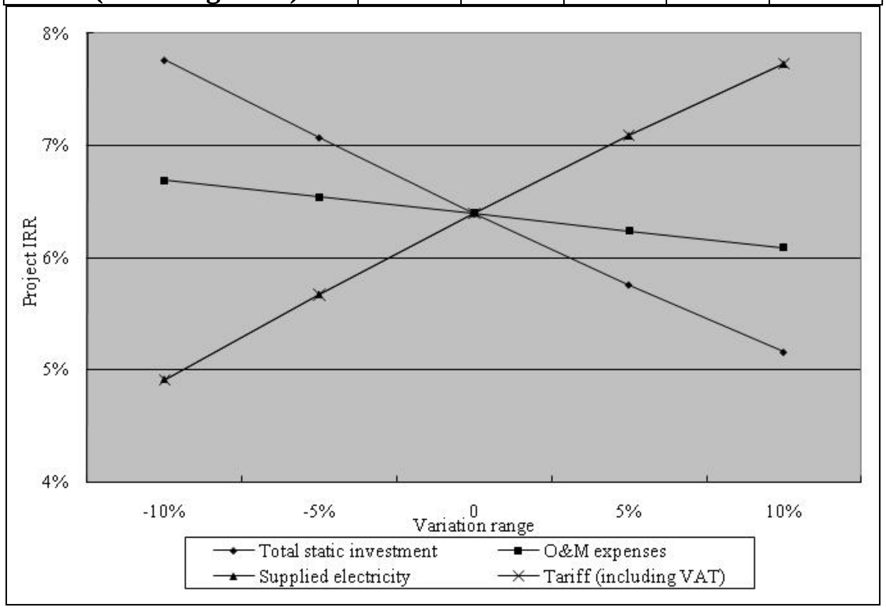

Figure 4. Results of sensitivity analysis
(without CER revenues)

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 static investment were decreased by at least 11.65%;
- The O&M expenses were decreased by at least 56.68%;
- The tariff were increased by at least 12.14%;
- The supplied electricity were increased by at least 12.14%.

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

• **Regarding the total static investment**

The FSR of the Project has been finalized by Shanxi Electric Power Exploration & Design Institute. Shanxi Electric Power Exploration & Design Institute is a qualified organization which has qualification Level I in electric power engineering[9]. So the FSR compiled by Shanxi Electric Power Exploration & Design Institute provides reliable assessment on the total static investment of the Project. Moreover, since the total value of main contracts of equipments and engineering accounts for more than 90% of the total static investment estimated in the FSR, it is impossible to decrease the total static investment by 11.65%.

• **Regarding the O&M expenses**

Assessment on the O&M expenses of the Project is obtained from the FSR finalized by Shanxi Electric Power Exploration & Design Institute thus reliable. As listed above, the O&M expenses of the Project comprise maintenance fee, salary and welfare of employees, material and miscellaneous fee, and insurance fee. As for these four components, the amount of maintenance fee is the largest, accounting for 54.8% the O&M expenses. And the maintenance fee will not decrease since the year-on-year increase of the index of producer price of industrial products in Liaoning Province during 2003~2008 is 3.6%[10] at least. Therefore, it is impossible to decrease the O&M cost by 56.68%.

• **Regarding the tariff**

Before the compilation of the FSR of the Project, there were three tariff policies for wind power projects issued after November 11, 2001, i.e. Document No. FGJG[2003]424, Document No. FGJG[2007]3303 and Document No. FGJG[2008]1876. According to these tariff policies, the highest tariff of wind power projects in Liaoning Province is 0.61 RMB/kWh (including VAT). Therefore, the FSR of the Project was compiled based on the highest tariff of wind power projects in Liaoning Province (0.61 RMB/kWh (including VAT)). On July 20, 2009, NDRC issued *Circular on the Establishment of Feed-in Tariffs for On-grid Wind Power Projects* (Document No.FGJG[2009]1906) on the national wind power tariff policy. According to Document No.FGJG[2009]1906, the Project is located in Type IV resource area and shall apply the tariff of 0.61 RMB/kWh (including VAT). Therefore the tariff of 0.61 RMB/kWh (including VAT) used in the investment analysis of the Project is in line with the government guidance on tariff. Moreover, in the tariff approval issued by Liaoning Price Bureau on December 9, 2010 (Document No.LJH[2010]154), the tariff of the Project was approved as 0.61 RMB/kWh (including VAT). Furthermore, according to *Information Note on the Highest Tariffs Applied by the EB in its Decisions on Registration of Projects in the People's Republic of China* (version 01) published by CDM EB, the tariff of 0.61 RMB/kWh (including VAT) used in the investment analysis of the Project is the highest tariff of wind power projects in Liaoning Province.

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 government guidance on tariff and the tariff approved by Liaoning Price Bureau for the Project and is the highest tariff of wind power projects in Liaoning Province, thus it is impossible to increase the tariff by 12.14%.

9 Http://baike.baidu.com/view/1870564.htm.

10 *China Statistical Yearbook 2009* (http://www.stats.gov.cn/tjsj/ndsj/2009/indexch.htm).

• **Regarding the supplied electricity**

The supplied electricity in the FSR is estimated based on the long term wind resources analysis. When preparing the FSR, the operating 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 best[11]. Therefore, it is impossible to increase the supplied electricity by 12.14% throughout the lifetime of the Project.

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 impacted.

As described above, "the Project undertaken without being registered as a CDM project activity" is not financially attractive to investors, thus is not feasible. Therefore, the baseline scenario of the Project is the continuation of electricity supply from the grid. 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 10.5 EURO/tCO_2e, 7 yrs×3 crediting period), the project IRR will be significantly improved to reach the benchmark, as shown in Table 5.

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

	the Project	the benchmark
Without CER revenues (%)	6.40	8
With CER revenues (%)	8.84	8

It is shown in Table 5 that "the Project undertaken without being registered as a CDM project activity" is unlikely to be financially attractive.

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 that rely on a broadly similar technology or practices, are of a similar scale, take place in a comparable environment with respect to regulatory framework and are undertaken in the relevant country/region". The Project is a newly built wind farm with an installed capacity of 49.5 MW located in Liaoning Province. In China, the provincial government is the highest level of local government. The region is only a geological conception and there is no any governmental institution at "regional level". The local regulatory framework is often set by local government (e.g. price regulation, investment policy and so on). Then only the activities in the same province could be regarded as sharing the same "comparable environment" and that is why the province is selected as the boundary of common practice analysis in this PDD. 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

11 The FSR of the Project.

framework with a starting date of construction later than January 1, 2002 and operation later than January 1, 2003[12].

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 similar activities identified with the above criteria have been started validation or registered as CDM projects[13], so they will not be taken into consideration under common practice analysis.

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

No project activity similar to the Project is identified in Liaoning Province[14]. The fact demonstrates that the Project does not belong to common practice and fulfils the requirement of additionality.

To summarize, "the Project undertaken without being registered as a CDM project activity" is not financially attractive to investors, thus is not feasible. Therefore, the baseline scenario of the Project is the continuation of electricity supply from the grid. 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., $PE_y = 0$ tCO_2e.

II. Calculate the baseline emissions

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12 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). Construction period for wind farm is 1 year.

13 *Statistics of Wind Power Installed Capacity in China* 2007-2009 (published annually), by Chinese Wind Energy 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).

14 *Statistics of Wind Power Installed Capacity in China* 2007-2009 (published annually), by Chinese Wind Energy 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).

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/yr);

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

$EF_{grid,CM,y}$ 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/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

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

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

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 CDM project activity in year y (MWh/yr);

$EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr);

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

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

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

Calculation of the emission factor of Northeast China Grid, the relevant 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 *Notification on Determining Baseline Emission Factor of China's Grid* issued by China's DNA which provides the delineation of the relevant electricity systems, Northeast China Grid is the connected electricity system of the Project. Northeast China Grid is composed of Heilongjiang Power Grid, Jilin Power Grid and Liaoning Power Grid.

There exists no net electricity import to Northeast China Grid[15], 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)

Four methods are provided in *Tool to Calculate the Emission Factor for an Electricity System* for the calculation of the 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 *Notification on Determining Baseline Emission Factor of China's Grid* (published on July 2, 2009), 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 account for about 5% in 2003, 6% in 2004, 8% in 2005, 6% in 2006 and 5% in 2007[16], 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.

15 Http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm.
16 *China Electric Power Yearbook 2004~2008* (published annually).

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[17] 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 ($EF_{grid,OMsimple,y}$). The formula of $EF_{grid,OMsimple,y}$ calculation is

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

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

Where:

$EF_{grid,OMsimple,y}$ is the simple operating margin CO_2 emission factor in year y (tCO_2e/MWh);

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

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

$EF_{CO2,i,y}$ is the CO_2 emission factor of fossil fuel type i in year y (tCO_2e/GJ);

EG_y is the net quantity of 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/yr);

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 thermal 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.

17 Http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm.

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 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 *Notification on Determining Baseline Emission Factor of China's Grid*, 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 comprise the larger annual generation should be used.

Considering data availability, CDM EB accepts the following deviation in application of methodology[18]:
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 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

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

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_2/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 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.

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

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

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

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.

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 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 *Notification on Determining Baseline Emission Factor of China's Grid* (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:

$$ER_y = BE_y - PE_y \tag{12}$$

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 2005/2006/2007/2008*
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:	$GEN_{j,y}$
Data unit:	MWh
Description:	Total thermal power generation of province j of Northeast China Grid in year y
Source of data used:	*China Electric Power Yearbook 2006/2007/2008*
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 2006/2007/2008*
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 2006/2007/2008*
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 the 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 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:	*Notification on Determining Baseline Emission Factor of China's Grid* (published on July 2, 2009)
Value applied:	322.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from *Notification on Determining Baseline Emission Factor of China's Grid* 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:	*Notification on Determining Baseline Emission Factor of China's Grid* (published on July 2, 2009)
Value applied:	246
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from *Notification on Determining Baseline Emission Factor of China's Grid* 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/yr.

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

According to the FSR, the electricity delivered by the Project to the grid is estimated as 104,115 MWh per year. According to *Notification on Determining Baseline Emission Factor of China's Grid* (published on July 2, 2009), the baseline emission factor of the Project is 1.028025 tCO_2e/MWh. Therefore, the annual baseline emissions of the Project are estimated as 107,033 tCO_2e/yr.

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = 104{,}115 \times 1.028025 = 107{,}033 \text{ tCO}_2\text{e/yr}$$

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 107,033 tCO_2e.

$$ER_y = BE_y - PE_y = 107{,}033 - 0 = 107{,}033 \text{ tCO}_2\text{e/yr}$$

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 749,231 tCO_2e over the first 7-year crediting period from April 1, 2011 to March 31, 2018.

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)
April to December, 2011	0	80,275	0	80,275
2012	0	107,033	0	107,033
2013	0	107,033	0	107,033
2014	0	107,033	0	107,033
2015	0	107,033	0	107,033
2016	0	107,033	0	107,033
2017	0	107,033	0	107,033
January to March, 2018	0	26,758	0	26,758
Total (tCO_2e)	**0**	**749,231**	**0**	**749,231**

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/yr
Description:	Quantity of net electricity generation supplied by the Project to the grid in year y
Source of data to be used:	Calculated using the formula: $EG_{facility,y} = EG_{PJtoGRID,y} - EG_{GRIDtoPJ,y}$.
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	104,115
Description of measurement methods and procedures to be applied:	The data will be calculated using the formula $EG_{facility,y} = EG_{PJtoGRID,y} - EG_{GRIDtoPJ,y}$.
QA/QC procedures to be applied:	Receipts are used for crosscheck.
Any comment:	-

Data/Parameter:	$EG_{PJtoGRID,y}$
Data unit:	MWh/yr
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	104,115
Description of measurement methods and procedures to be applied:	Continuously measured by two bidirectional meters (one main meter and one backup meter) installed at the low voltage side of the main transformer at the Project Site and monthly recorded.
QA/QC procedures to be applied:	Receipts are used for crosscheck.
Any comment:	-

Data/Parameter:	$EG_{GRIDtoPJ,y}$
Data unit:	MWh/yr
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 two bidirectional meters (one main meter and one backup meter) installed at the low voltage side of the main transformer at the Project Site and monthly recorded.
QA/QC procedures to be applied:	Receipts are used for crosscheck.
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 by the Project from the grid ($EG_{GRIDtoPJ,y}$) will be monitored.

2. Monitoring System Organization Chart

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

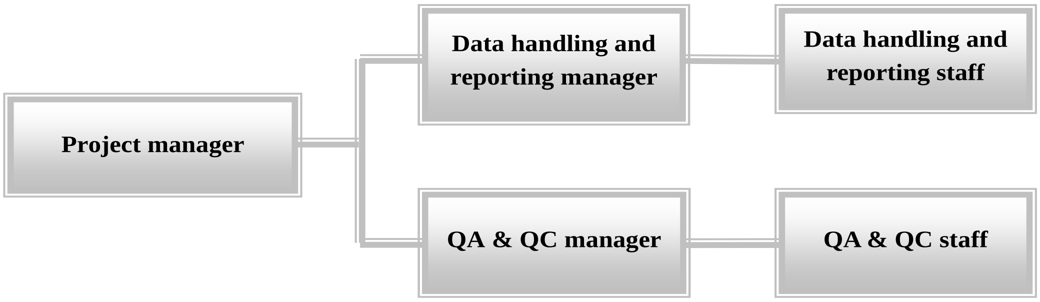

Figure 5. The monitoring system

The Project Manager is responsible for implementation and supervision of the monitoring activity and liaison in 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 ($EG_{PJtoGRID,y}$) will be measured continuously by two bidirectional meters (one main meter and one backup meter) installed at the low voltage side of the main transformer at the Project Site and monthly recorded.
The electricity imported by the Project from the grid ($EG_{GRIDtoPJ,y}$) will be measured continuously by two bidirectional meters (one main meter and one backup meter) installed at the low voltage side of the main transformer at the Project Site and monthly recorded.

4. Precision of Meters

The measurement precision of the meters employed by the Project will be at least 0.5s.

5. Data Management System

The electronic data collected including readings from meters installed at the low voltage side of the main transformer at the Project Site will be kept at least for two years after the end of the last crediting period.

6. Quality Assurance and Quality Control Procedure

QA&QC procedure will include calibrating monitoring equipments, managing and processing the monitored data.

All meters will be calibrated once a year according to the national standard. Monitoring training will be periodically arranged for relevant staff to ensure that they have a thorough understanding of the monitoring procedures.

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 15/09/2010 by:

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

>>

20/06/2009 (*Civil Engineering Contract* of the Project 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:

>>

01/04/2011[19]

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.

19 The date here is an expected starting date of the first crediting period. The actual starting date of the first crediting period will be the actual registration date of the Project.

SECTION D. Environmental impacts

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

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The Environmental Impact Statement Form was completed by Liaoning Academy of Environmental Sciences and approved by Liaoning Environment Protection Bureau on February 5, 2009 (Document LHSB[2009] No.2). 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

Only a small quantity of domestic waste water (14.4 t/d) will be produced during the construction period. Domestic waste water will be transported out of the Project Site via storage tanks and will be forbidden to be indiscriminately discharged. During the operation period, domestic waste water produced in the Project will be discharged into septic tanks, timely cleared and transported, and finally used as fertilizer for farmland. Therefore, the Project will not have any negative impact on water environment at the Project Site.

Dust and exhaust gas

There is no discharge of dust or exhaust gas during the operation period of the Project. During the construction period, generation of dust reentrainment is mainly due to excavation, piling, backfilling, cleaning and transportation of earth, transportation, loading and unloading and piling of construction materials, the operation of vehicles, land flatting and road expansion. Dust generated during the construction period of the Project will have few impacts on nearby residents. Moreover, the Project Owner will take measures such as watering and covering the material piling areas, to ensure that the Project will not have any negative impact on the surroundings.

Noise

Noises generated during construction period of the Project mainly stem from the operation of construction machines and equipments. The distance between the main construction site and the resident area is more than 500 m. Therefore, after attenuation, noises during the construction period will meet the requirement of *Noise Limits for Construction Site* (GB12523-90). Moreover, the Project Owner will strengthen the maintenance and conservation of equipments and limit the time of construction and transportation, in order to ensure that noises generated during the construction period will not impact local residents. During the operation period of the Project, noises will be generated mainly from operation of turbines. After attenuation, noises generated during the operation period of the Project 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 mainly includes spoil and the domestic waste of workers. The spoil will be used for land flatting and road paving. The domestic waste will be collected and transported to landfills. Therefore, the solid waste produced in the Project will not have any negative impact on the surroundings.

Ecological impact

Damage to the vegetation caused by permanent land occupation of the Project will be compensated correspondingly. And damage to the vegetation caused by temporary land occupation will be recovered.

By taking measures of vegetation recovery and compensation, the Project will not have any negative 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 May 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. For the total 30 questionnaires distributed to the stakeholders, 30 returned with a response rate of 100%. According to the 30 questionnaires returned, the basic structure of the respondents is illustrated in Table 7.

Table 7. Structure of the respondents

Structure of gender		
Gender	**No.**	**Percentage (%)**
Male	21	70
Female	9	30

Structure of educational level		
Educational level	**No.**	**Percentage (%)**
Primary school	3	10
Junior middle school	20	67
Senior middle school	7	23

Structure of age		
Age	**No.**	**Percentage (%)**
Below 30	6	20
30~39	7	23
40~49	9	30
50 and above	8	27

The questionnaires mainly focus on the following issues:

• The stakeholders' knowledge about wind farms and wind power projects;
• Impacts possibly introduced by the construction of the Project from the view of stakeholders;
• The attitude of the stakeholders on the construction of the Project.

E.2. Summary of the comments received:

>>

According to the 30 questionnaires received:

• 30 respondents (100%) support the construction of the Project. 27 respondents (90%) understand or have a very good understanding of wind farms and wind power projects.
• 25 respondents (83%) think the construction of the Project will increase the income of residents at the Project Site; 26 respondents (87%) think the construction of the Project will increase employment opportunities at the Project Site; 25 respondents (83%) think the construction of the Project will improve the living standard of residents at the Project Site.
• 29 respondents (97%) think the construction of the Project will not impact the discharge of waste water at the Project Site; 1 respondent (3%) thinks the construction of the Project could possibly increase the discharge of waste water at the Project Site.
• 28 respondents (93%) think the construction of the Project will not impact the discharge of air pollutants at the Project Site; 2 respondents (7%) think the construction of the Project will decrease the discharge of air pollutants at the Project Site.
• 21 respondents (70%) think the construction of the Project could possibly increase the discharge of noises at the Project Site; 9 respondents (30%) think the construction of the Project will not impact the discharge of noises at the Project Site.
• 30 respondents (100%) think the construction of the Project will not impact the discharge of solid wastes at the Project Site.

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

>>

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

The issues of waste water and noise considered by the respondents and corresponding prevention and control measures have been analyzed in Section D.1 of the PDD. The Project Owner will take measures to ensure that there will be no waste water and noise pollution to the local environment.

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 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 ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$) of the Project, data recommended in *Notification on Determining Baseline Emission Factor of China's Grid* published 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** D=A+B+C	**Emission factor ($kgCO_2$/TJ)** E	**NCV (MJ/t or 1000m^3)** F	**Emission[20] (tCO_2e)** G
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.

20 If the unit of the fuel is 10^4 t, then G=D×E×F/10^5; if the unit of the fuel is 10^8 m^3, then G=D×E×F/10^4. The same about the calculation of G in Table A.5 and Table A.6.

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

Fuel	Unit	Liaoning A	Jilin B	Heilongjiang C	Total Fuel D=A+B+C	Emission factor ($kgCO_2/TJ$) E	NCV (MJ/t or $1000m^3$) F	Emission (tCO_2e) G
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 D=A+B+C	Emission factor ($kgCO_2/TJ$) E	NCV (MJ/t or $1000m^3$) F	Emission (tCO_2e) G
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~A6, 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 D=A+B+C	Emission factor ($kgCO_2/TJ$) E	NCV (MJ/t or $1000m^3$) F	Emission[21] (tCO_2e) G
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	10^7m^3	0	0.2	20.3	20.5	54,300	38,931	433,360
Coke oven gas	10^7m^3	55.3	14.4	18.9	88.6	37,300	16,726	552,758
Other gas	10^7m^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 2008.

21 $G=D\times E\times F/10^5$.

Table A8. Emission factor of the best technology

	Variable	Electricity supply efficiency	Emission factor of fuel ($kgCO_2/TJ$)	Oxidation Rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000×B×C
Coal fired power plants	$EF_{Coal,Adv}$	38.10%	87,300	1	0.8249
Oil fired power plants	$EF_{Oil,Adv}$	49.99%	75,500	1	0.5437
Gas fired power plants	$EF_{Gas,Adv}$	49.99%	54,300	1	0.3910

Calculated with the data provided in Table A7 and Table A8, the value of λ_{Coal} is 98.59%, the value of λ_{Oil} is 0.18%, the value of λ_{Gas} is 1.23%, the value of $EF_{Coal,Adv}$ is 0.8249 tCO_2e/MWh, the value of $EF_{Oil,Adv}$ is 0.5437 tCO_2e/MWh and the value of $EF_{Gas,Adv}$ is 0.3910 tCO_2e/MWh.

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.