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:

>>

Liaoning Beipiao Beitazi Ⅰ Wind Farm Project
Version 02.7
Date: 27/11/2009

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A.2. Description of the project activity:

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Liaoning Beipiao Beitazi Ⅰ Wind Farm Project (hereinafter referred to as "the proposed project") is located at Xiaodianzi village, Beita County, Beipiao City, Liaoning Province. The primary objective of the proposed project is to generate renewable electricity to meet the ever-increasing demand in the Liaoning Provincial Grid which is the part of the Northeast China Grid (NECG). Equivalent electricity service provided by the Northeast China Grid is chosen as the baseline scenario for the proposed project activity. The proposed project is a new wind power project, the scenario existing is the same with the baseline scenario.

According to the conditions of the local wind resource, the proposed project with an installed capacity of 49.5 MW(1500 kW×33 units) is expected to supply 110,458 MWh electricity annually to the Northeast China Grid (NECG) through the Liaoning Provincial Grid and the operation life is 20 years. Electricity generated by the proposed project will displace part of the electricity generated by the NECG which is dominated by fuel-fired power plants, and thus greenhouse gas (GHG) emission reductions could be achieved. The estimated annual GHG emission reductions are 126,010 tCO_2e during the first crediting period.

The proposed project will not only supply renewable electricity to grid, but also contribute to sustainable development of the local community and the host country:

- Supply reliable, zero-emitting renewable energy to the NECG;
- Save the coal and water resources and improve the local energy structure;
- Increase local incomes and provide 17 permanent job opportunities;
- Decrease the GHG emission from the fossil-fuel fired power plants, particularly the emission of SO_x, NO_x and dust.

A.3. Project participants:

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Name of Party involved (*)((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P. R. China (host)	Zhongdiantou Northeast New Energies Development Co., Ltd.	No
Germany	KfW	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

See Annex 1 for details.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party (ies):

>>
People's Republic of China

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

>>
Liaoning Province

A.4.1.3. City/Town/Community etc:

>>
Beita County, Beipiao 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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Liaoning Beipiao Beitazi Ⅰ Wind Farm Project is located at Xiaodianzi village, Beita County, Beipiao City, Liaoning Province. The coordinates of the proposed project are: 120.8656°-120.9258°E , 42.2192°-42.2609°N. The altitude of the proposed project site is about 340-430m. The following figure shows the location of the proposed project.

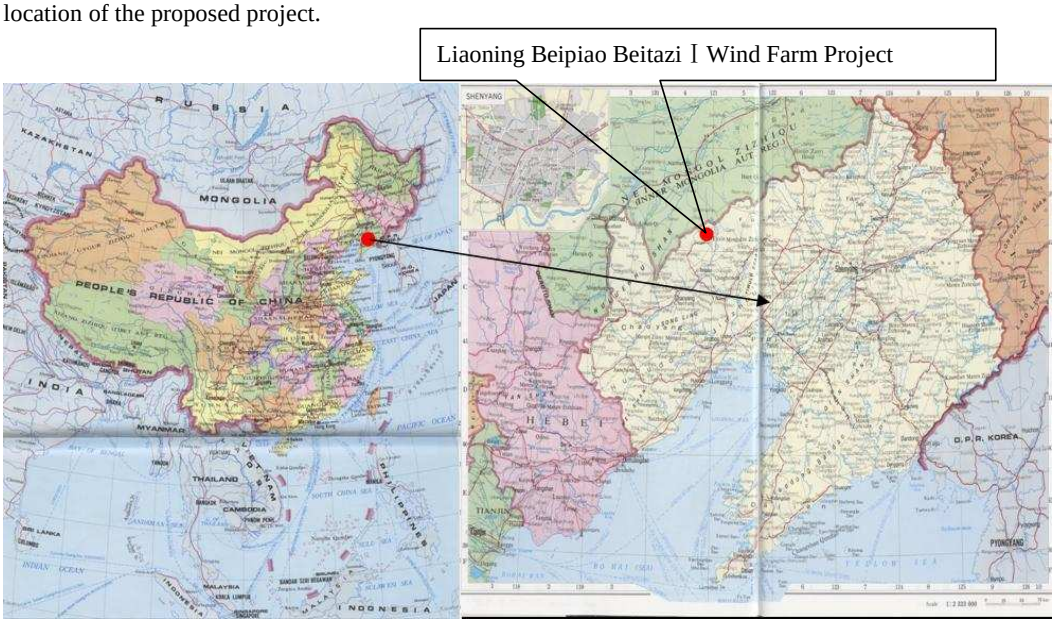

Figure A-1 The location of Liaoning Beipiao Beitazi Ⅰ Wind Farm Project

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

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The proposed project falls into:
Sectoral Scope 1: energy industries (renewable - / non-renewable sources)
Project Activity: Grid-connected renewable power generation;
Electricity capacity addition from a wind-power project.

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

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33 units of wind generators（Goldwind 77-1500）,which were manufactured by Xinjiang Goldwind Science & Technology Co., Ltd., will be installed in the proposed project, with the capacity of each unit being 1500 kW, forming a total capacity of 49.5 MW. The lifetime of the wind turbines is 20 years. The generators are doubly-fed wind-power generators, which adopt the technology of pitchregulation with three-bladed, horizontal-axis and upwind. The supplier will provide training service during the construction and operation period of the proposed project.

One 66 kV step-up station is going to be built in the wind farm during the construction period. The proposed project adopts turbine-transformer unit boosting voltage to 10 kV. All transformers are linked with the 10 kV suspension lines and are connected to 66 kV step-up station which is built by the project owner to boost voltage to 66kV. The length from 66 kV step-up station to Beipiao 220 kV transmission substation is about 51.98km. The electricity will be supplied to the NECG through Beipiao 220 kV transmission substation.

Table A-1 Technical data of the turbine units

Specification of Wind Turbine			
	Item	Value	Source
Rotor	Diameter Height of Hub Area swept Number of blades Nominal revolutions	77 m 65m 4657 m^2 3 17.3 rpm	The purchase contract of turbines
Operational data	Cut-in wind speed Nominal wind speed Cut-out wind speed	3 m/s 11.5 m/s 22 m/s	The purchase contract of turbines
Generator	Nominal output Rated voltage	1500 kW 620/690 V	The purchase contract of turbines

All technologies utilized in the project activity are domestic technologies and no technology will be transferred to China through this project activity.

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

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7×3 year renewable crediting period is chosen for the proposed project. Annual emission reduction of the proposed project is estimated to be 126,010 tCO_2e during the first crediting period (from September, 2009 to August, 2016).

Years	Annual estimation of emission reductions in tones of CO_2 e
September,2009- August, 2010	126,010
September,2010- August, 2011	126,010
September,2011- August, 2012	126,010
September,2012- August, 2013	126,010
September,2013- August, 2014	126,010
September,2014- August, 2015	126,010
September,2015- August, 2016	126,010
Total estimated reductions (tones of CO_2 e)	882,070
Total number of crediting years in 1st crediting period	7
Annual average over the crediting period of estimated reductions (tones of CO_2e)	126,010

Note: The starting date of the first crediting period is estimated to be September 1, 2009, and the deadline is August 31, 2016.

A.4.5. Public funding of the project activity:

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No public funding from Annex I Parties is involved in this project activity.

SECTION B. Application of a baseline and monitoring methodology

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

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1. ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", (version 07, EB36);
2. Tool for the demonstration and assessment of additionality, (version 05.2, EB39);
3. Tool to calculate the emission factor for an electricity system, (version 01.1, EB35);
4. Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, (version 02, EB41).

For more information regarding the methodology, please refer to the link:

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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According to the methodology ACM0002, the following conditions are applicable:

- *The project activity is the installation or modification/retrofit of a power plant/unit of one of the following types: hydro power plant/unit, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;*
- *The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.*

As a grid-connected wind farm project, the proposed project meets all the applicability criteria of ACM0002 as following:

• The project is a new wind farm plant to supply the electricity capacity additions;
• The project does not involve switching from fossil fuels to a renewable energy source at the proposed site;
• The geographic and system boundaries for the electricity grid (NECG) to which the proposed project will be connected can be clearly identified and information on the characteristics of the grid is available.

Therefore, ACM0002 is applicable to the proposed project.

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

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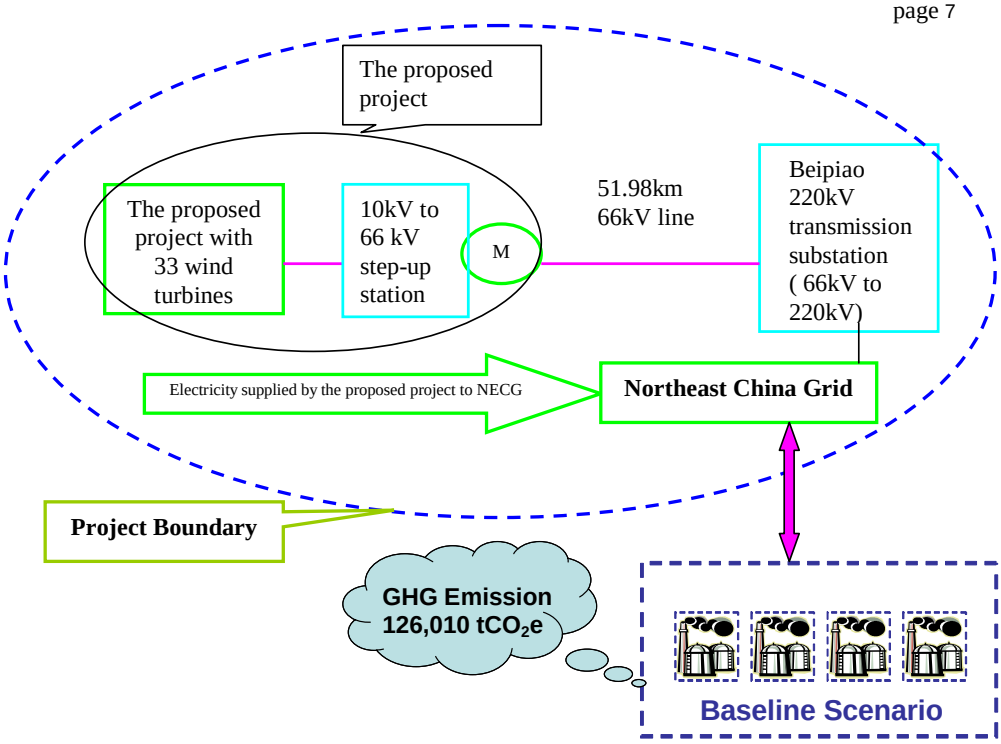
The project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. According to China's DNA[1], the NECG has the significant transmission between provincial grids and is difficult to separate single provincial grid. So, the electricity system of the proposed project is the Northeast China Grid which covers three Provincial Grids (the Liaoning Provincial Grid, the Jilin Provincial Grid and the Heilongjiang Provincial Grid).
Therefore, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the Northeast China Grid that the proposed project is connected to.

[1] *2008 Baseline Emission Factors for Regional Power Grids in China*
http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2976



Note: M: The metering system, monitoring electricity supplied by the proposed project to the NECG and the electricity supplied by the NECG to the project, is installed at the 66kV step-up station, which was ensured in the Power Purchase Agreement.

Figure B-1 The flow diagram of the project boundary

According to the methodology ACM0002, the emission source and the category of GHG is described as in table B-1:

Table B-1 the emission source and the category of GHG

	Source	Gas	Included?	Justification / Explanation
Baseline	the Northeast China Grid	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	The proposed project	CO_2	No	Excluded by the methodology for wind farm projects
		CH_4	No	Excluded by the methodology for wind farm projects
		N_2O	No	Excluded by the methodology for wind farm projects

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

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According to ACM0002 (version 07), if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:
Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

The proposed project is a new grid-connected wind power plant, therefore, the baseline scenario is electricity delivered to the Northeast 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, and the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

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

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At the beginning of design, since the proposed project faced investment barriers which is demonstrated in the Feasibility Study Report, the suggestion of searching for support from CDM was given in the Feasibility Study Report[2] by Liaoning Electric Power Survey & Design Institute in July 2007. The project owner decided to develop the proposed project as the CDM project, and approved China Power Complete Equipment Co., Ltd. (CPCEC） taking in charge of the CDM Development and CER Sale in July 2007. The proposed project started construction in September 2007. The ERPA was signed between the project owner and KfW at the end of the year 2007. The PDD of the project was published on UNFCCC website for global stakeholder comments on 06/02/2008 and the LoA from China has been achieved in May, 2008. Therefore, The CDM has been considered seriously in the decision to proceed with the proposed project and was the most important decision-making factors for the investment of the project.

An overview of key events is given in Table B-2.

Table B-2 An overview of key events

Date	Key Event	Comments
07/2007	The Project FSR was prepared by Liaoning Electrical Power Survey & Design Institute.	The suggestion of searching for support from CDM was given in the Feasibility Study Report
04/07/2007	The project owner decided to develop the proposed project as the CDM project, and approved CPCEC taking in charge of the CDM Development and CER Sale.	Approval Letter by China Power Investment Corporation CPI[2007]No.191
22/08/2007	The approval letter to the Feasibility Study Report given by	The approval letter by Liaoning Provincial Development and Reform

[2] The Feasibility Study Report of the proposed project, P11; P212-P213.

	Liaoning Provincial Development and Reform Commission	Commission [2007]No.791
20/09/2007	The construction of the project activity begun.	Project construction starting permission by the Heilongjiang Runhua Electrical Engineering Project Management Co., Ltd.
26/09/2007	The Wind Turbine Generator Purchasing Contract was signed.	The Wind Turbine Generator Purchasing Contract
14/12/2007	The Emission Reduction Purchasing Agreement (ERPA) was signed between the project owner and KfW.	The ERPA of the Project
29/01/2008	The contract was signed between the project owner and CPCEC.	The contract between the project owner and CPCEC
06/02/2008	PDD was published on UNFCCC website for global stakeholder comments.	UNFCCC Website (http://cdm.unfccc.int/Projects/Validation)
April, 2008 19/05/2008	The Letter of Approval from China (English Original) has been received. The Letter of Approval from China (Chinese Original) has been received.	The LoA from China

The following steps are used to demonstrate the additionality of the proposed project according to the "Tool for the demonstration and assessment of additionality":

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

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

Realistic and credible alternatives available to the proposed project that provide outputs or services comparable to the proposed project activity include:
a) The proposed project itself, but undertaken without being registered as a CDM project activity;
b) Construction of a fuel-fired power plant with equivalent amount of annual electricity generation;
c) Construction of a power plant using other renewable energy with equivalent amount of annual electricity generation;
d) Equivalent electricity service provided by the Northeast China Grid.

Besides wind energy, solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies. There exist no economically exploitable hydro resources with a commensurate scale to the project[3]. In China, solar power plants and biomass power plants are still in the demonstration phase and limited by the cost[45]. The project owner has no experience to develop solar

[3] http:// www.sxcoal.com/dl/2008/01/16/315690/article.html

[4] http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=5884.

power plants and biomass power plants. As for geothermal power plants, there are no available geothermal resources to generate electricity at the project site[6]. Therefore, these kinds of power plants cannot provide the equivalent amount of annual electricity generation as the proposed project. Therefore, the alternative c) is not feasible.

Outcomes of sub-step 1a:
In conclusion, realistic and credible alternatives available to the proposed project that provide outputs or services comparable to the proposed project activity include:
a) The proposed project itself, but undertaken without being registered as a CDM project activity;
b) Construction of a fuel-fired power plant with equivalent amount of annual electricity generation;
d） Equivalent electricity service provided by the Northeast China Grid.

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

b) Construction of a fuel-fired power plant with equivalent amount of annual electricity generation

In 2006, the average annual utilization hours of Chinese fuel-fired power equipments are 5612 hours[7]. Considering the same annual electricity generation, the alternative baseline scenario for the proposed project should be a fuel-fired power plant with installed capacity of 17 MW. Furthermore, as the proposed project is a grid-connected project, the alternative baseline scenario must be a grid-connected fuel-fired power project. According to Chinese power regulations, fuel-fired power plants of less than 135MW are prohibited to construct in the areas covered by large grids[8]. The alternative of building a 17 MW fuel-fired power plant conflicts with Chinese regulations. Therefore, alternative b) is not a realistic and credible alternative.

Alternative a), the proposed project itself, but undertaken without being registered as a CDM project activity, is in accordance with mandatory laws and regulations.

Alternative d), the Northeast China Grid as the provider for the same electricity output as the proposed project is in accordance with mandatory laws and regulations.

Outcomes of sub-step 1b:
Therefore, alternative a) and alternative d) satisfy China’s regulations and will be analyzed in Step 2 as potential baseline alternatives.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The “Tool for the Demonstration and Assessment of Additionality” recommends three analysis methods: simple cost analysis, investment comparison analysis and benchmark analysis.

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[5] http://www.newenergy.org.cn/Html/0089/9170821222.html

[6] http://www.crein.org.cn/view/viewnews.aspx?id=20080410133557851.

[7] China Electric Power Yearbook 2007 P626.

[8] Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with Capacity of 135 MW or below issued by the General Office of the State Council, decree no. 2002-6.

The proposed project produces economic benefits through the electricity sales other than CDM related income; therefore, the simple cost analysis cannot be applied. The investment comparison analysis is not applicable to the proposed project because the alternative of the proposed project is "Equivalent electricity service provided by the Northeast China Grid", not a single newly-built project. Hence, the benchmark analysis is chosen and the Internal Return Rate (IRR) is used to assess the financial viability of the project activity.

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

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*, the financial benchmark rate of return (after tax) of Chinese Power Industries is 8%[9] for the Project IRR of total investment.

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

1) Parameters needed for calculation of IRR
According to the Feasibility Study Report of the proposed project, parameters needed for calculation of IRR are as follows:

Table B-3 Parameters for calculation of IRR

Item	Value	Data source
Installed capacity	49.5 MW	Feasibility Study Report
Electricity delivered to grid	110,458 MWh	Feasibility Study Report
Operation Hour	2231 h	Feasibility Study Report
Total investment	RMB 502 million	Feasibility Study Report
Expected tariff(Excl. VAT)	RMB 0.501 /KWh	Feasibility Study Report
Tax		
VAT	8.5%	Feasibility Study Report
Extra VAT, including the following two parts:	8% of the VAT	Feasibility Study Report
Education tax	5% of the VAT	Feasibility Study Report
City Construction tax	3% of the VAT	Feasibility Study Report
Income tax	25%	Feasibility Study Report
Long-term Interest Rate	7.2%	Feasibility Study Report
Equity Ratio	20%	Feasibility Study Report
Average annual O&M Cost	RMB 9241 thousand	Feasibility Study Report
Operation life	20 years	Feasibility Study Report
Expected CERs price	EUR 11/tCO_2e	Estimated value

2) Comparison of the project IRR and the financial benchmark

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

In accordance with benchmark analysis, if the financial indicators of the proposed project, such as the project IRR, are lower than the benchmark, the proposed project is not considered to be financially attractive.

Table B-4 shows the project IRR with and without the income from CERs sale. Without the sales of CERs, the project IRR is 6.58% which is lower than the financial benchmark. Thus it demonstrates that the proposed project is not financially acceptable. Taking into account the CDM revenues, the project IRR is 8.73% and higher than the financial benchmark. Therefore, the CDM revenues enable the project to overcome the investment barrier.

Table B-4 Comparison of IRR with and without the income from CERs sale

Item	Without CDM	Benchmark	With CDM
Project IRR	6.58%	8%	8.73%

Sub-step 2d. Sensitivity analysis

For the proposed project, four parameters were selected as sensitive factors to check out the financial attractiveness:

1) Total static Investment
2) Annual O&M Cost
3) Electricity-delivered-to-Grid
4）Tariff (Excl.VAT)

The result of sensitive analysis of the above parameters is shown in Table B-5 and Figure B-2 below.

Table B- 5 Sensibility analysis of the proposed project

	-10%	0	10%
Total static Investment	8.00%	6.58%	5.37%
Tariff （Excl.VAT）	5.25%	6.58%	7.84%
Electricity-delivered-to-grid	5.25%	6.58%	7.84%
Annual O&M Cost	6.79%	6.58%	6.36%

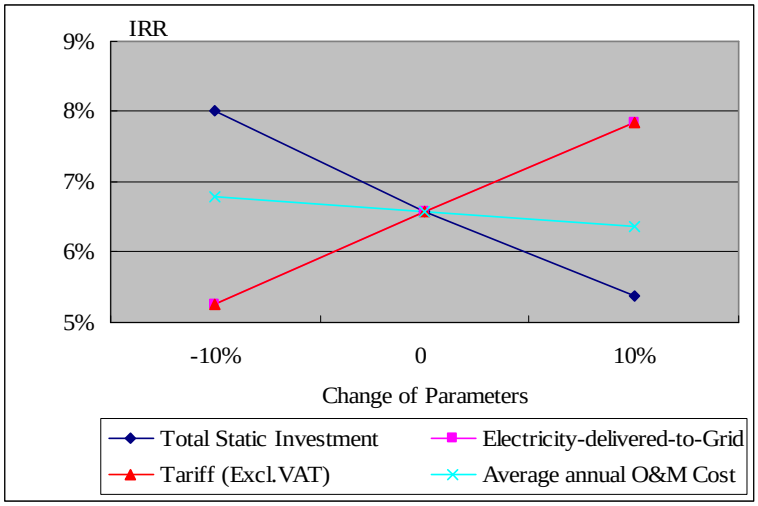

Figure B-2 Sensibility analysis of the proposed project

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

- The Total Investment drops by at least 10%;
- The Expected Tariff (Excl. VAT) increases by at least 11%;
- The electricity-delivered-to-grid increases by at least 11%;
- The annual O&M cost drops by at least 68%.

When the Total Static Investment drops by 10%, the IRR may be equal to the investment benchmark. However, the actual situation is that the Total Investment will not decrease considering the increasing price of materials. The cost of materials is the main part of the total static investment. It is impossible to decrease the total investment because the price of materials, such as iron and cement, keeps increasing in recent years[10]. Therefore, the Total Investment will not drop because of the increasing price of materials. So, it is impossible for the IRR be equal to or more than the investment benchmark.

When the Expected Tariff (Excl. VAT) increases by 11%, the project IRR (7.967%) is nearly equal to the benchmark IRR (8%). But in fact, the tariff will not increase by 11%. The tariff of the proposed project will be approved by China's NDRC before starting operation. Consulting the tariff of similar scale wind power farms as the proposed project in Liaoning Province approved by China's NDRC from 2007 to the first half year of 2008, it keeps the same. Namely, the first total operation hours of 30,000 h adopt RMB 0.61/kWh (Incl.VAT), and the other operation years adopt the average tariff in the local area[11]. The Liaoning Grid, the part of the Northeast China Grid, is dominated by coal-fired power plants; the average tariff is the tariff of the coal-fired power plants in fact. According to the above principle, if the expected

[10] http://www.realestate.cei.gov.cn/files/20082/2008f2d1c5261972.html; http://www.chinacement.org/jingcai_wz_zw.asp?ID=391.

[11] http://www.sdpc.gov.cn/zfdj/jggg/dian/t20080218_193009.htm

http://www.sdpc.gov.cn/zfdj/jggg/dian/t20080813_230724.htm.

tariff (Incl.VAT) adopts RMB 0.61/kWh in the total operation hours of 30,000 h, and the other operation years adopts RMB 0.3621/kWh in the investment analysis, the IRR of the proposed project (after tax) is 7.18% and could not reach the benchmark (8%). RMB 0.3621/kWh (Incl.VAT) is the highest tariff of the coal-fired power plants[12] in Liaoning Province. As a result, the project IRR will not meet the benchmark IRR.

When the electricity-delivered-to-grid increases by 11%, the project IRR (7.967%) is nearly equal to the benchmark IRR (8%). But in fact, the electricity-delivered-to-grid is influenced by the local wind resource. The wind power data used in the Feasibility Study Report and the Electricity-delivered-to-grid Report of the proposed project adopts one-year metrical data and based on the 30-year (1976-2005) data measured by the local weather station. The average metrical wind power data is 2.8m/s in the metrical year, which is more than the average 30-year data (2.4m/s) [13]. The above data were the statistics from the same local weather station. Therefore, the project IRR will not meet the benchmark IRR because of the limit of the local wind resource.

From the above table B-5 and figure B-2, the annual O&M cost has a little impact on the project IRR. Only when the annual O&M cost drops by 68%, the project IRR (7.996%) will be nearly equal to the benchmark IRR (8%). But the annual O&M cost is composed of the salary and welfare allowance, the material expenses, the repairs retained and other expenses, which are computed according to the national and local regulation. It is impossible to drop by 10%, not even to drop by 68%. Therefore, the project IRR will not meet the benchmark IRR.

This result further demonstrates the financial unfeasibility of the proposed project without CDM revenues.

Outcomes of step 2:
Based on the Investment Analysis above, the proposed project is not financially attractive without consideration of CERs sales revenues. Alternative a) of the proposed project undertaken without being registered as a CDM project activity is not feasible thus not baseline scenario.

Step 4 Common practice analysis

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

In China, the regulatory framework and investment environment for wind farm projects are only similar and comparable in the same Province/Autonomous Region. Most of wind farm projects are approved by the provincial government, tariff and regulations are usually similar for wind farm projects in the same province. Therefore, province is selected as the physical boundary of the statistics. The project is located in Liaoning Province, thus wind farm projects in Liaoning Province are selected to analyze common practice. All the wind farm projects are listed in the *China Wind Farm Installed Capacity Statistic in 2007* by Shi Pengfei. These projects consist of the built and being built projects until 2007 and are not considered the limit for the capacity. See details in table B-6. The wind farms which have been

[12] http://www.sdpc.gov.cn/zfdj/jggg/dian/t20060630_128823.htm

[13] the Feasibility Study Report of the proposed project, P21.

the Electricity-delivered-to-grid Report of the proposed project by Xinjiang Goldwind Science & Technology Co., Ltd.

published on the UNFCCC website for global stakeholder consultation have been added in the revised PDD.

Table B-6 Built and Being built Wind farm Projects in Liaoning Province until 2007

Title	Installed Capacity	The date of starting production	Note
Liaoning Dalian Hengshan	7.4MW	1993	RMB 0.9/kWh (Incl. VAT)[14]
Liaoning Wafangdian Donggang	22.45MW	1994	RMB 0.9154/kWh (Incl. VAT) [14]
Liaoning Yuji Jinzhou	3.75MW	1999	Small Pilot project
Liaoning Xianrendao	33.66MW	1999	RMB 1.00/kWh (Incl. VAT) [15]
Liaoning Dandong Haiyanghong	21MW	2000	RMB 1.00/kWh (Incl. VAT) [16]
Liaoning Changhai Zhangzidao	3.0MW	2002	Small Pilot project supported by National debt[17]
Liaoning Changhai Xiaochangshan	3.6MW	2002	Small Pilot project supported by National debt[17]
Liaoning Faku Sijiazi	9.6MW	2002	RMB 0.83/kWh [18]
Liaoning Changhai Dachangshan	3.6MW	2003	Small Pilot project supported by National debt[17]
Liaoning Kangping	24.65MW	2003	Registered[19]
Liaoning Zhangwu	24.65MW	2003	Registered[20]
Liaoning Huanren Pulepu	24.65MW	2006	Registered[21]
Liaoning Changtu	49.5MW	2006	Registered[22]
Liaoning Xingcheng	49.5MW	2006	Registered[23]
Liaoning Diaobingshan	49.5MW	2007	Registered[24]
Liaoning Faku Wanghaisi East	22.1MW	2007	At validation[25]

Deleted: are requesting for registration of the CDM project activities are not listed in table B-6.

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[14] http://www.fenglifadian.com/fengdianzhishi/281GHFFD.html

[15] http://www.wwls.cn/law/32361.html

[16] http://www.wwls.cn/law/32341.html

[17] http:// finance.people.com.cn/GB/1037/6036296.html

[18] http://finance.people.com.cn/GB/1038/59942/59949/6045289.html

[19] http://cdm.unfccc.int/Projects/DB/DNV-CUK1153828094.42/view

[20] http://cdm.unfccc.int/Projects/DB/DNV-CUK1154525743.09/view

[21] http://cdm.unfccc.int/Projects/DB/DNV-CUK1199956532.2/view

[22] http://cdm.unfccc.int/Projects/DB/DNV-CUK1169618157.26/view

[23] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1195741055.25/view

[24] http://cdm.unfccc.int/Projects/DB/DNV-CUK1218622278.09/view

Liaoning Shenyang Faku Wanghaisi	20.4MW	2007	At validation[26]
Liaoning Changtu Quantou	49.3MW	2007	At validation[27]
Liaoning Fuxin Gaoshanzi	100.5MW	2008	At validation[28]

Source：China Wind Farm Installed Capacity Statistic in 2007 by Shi Pengfei
http://www.cwea.org.cn/upload/20080324.pdf

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

In Table B-6, the projects are selected as similar projects to the proposed project in Liaoning Province. Dalian Hengshan wind farm project, Wafangdian Donggang wind farm project, Xianrendao wind farm project and Dandong Haiyanghong wind farm project, all started early and obtained the high tariff listed in table B-6, which is higher than the tariff of the proposed project. Yuji Jinzhou wind farm project was the small pilot project. Changhai Zhangzidao wind farm project, Changhai Xiaochangshan wind farm project, Changhai Dachangshan wind farm project were all small pilot projects supported by National debt. Faku Sijiazi wind farm project also obtained the higher tariff than the proposed project. Therefore, the proposed project with lower on-grid tariff and without any preferential policies is not similar to the above projects. All the other wind farms in Table B-6 have already successfully been registered in EB, which are not similar to the proposed project.

From the above analysis and discussion, without a higher supporting tariff of favorable financial support, the development of similar wind farms in Liaoning province faces financial barriers as the proposed project and is not feasible in Liaoning province. Therefore, there are not similar projects as the proposed project in Liaoning Province. The proposed project is not a common practice.

In conclusion, the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

ACM0002, the *tool to calculate the emission factor for an electricity system*, the *tool to calculate project or leakage CO_2 emissions from fossil fuel combustion* and *2008 Baseline Emission Factors for Regional Power Grids in China*[29] are applied as the following steps, and the data are from *China Electric Power Yearbook* and *China Energy Statistical Yearbook*

Deleted: [25]

Four steps are utilized to calculate the emission reductions:
Ⅰ. Calculate the Baseline Emission （BE_y）

[25] http://cdm.unfccc.int/Projects/Validation/DB/ZSH8OQVCIFJZEGCZ03FM7TYPYMQC1N/view.html

[26] http://cdm.unfccc.int/Projects/Validation/DB/R9XI9G6HV6GG3CS9RBSHBHLXGEZ7AO/view.html

[27] http://cdm.unfccc.int/Projects/Validation/DB/287INEMJOF3XRG05RHSSUI87OCKMMB/view.html

[28] http://cdm.unfccc.int/Projects/Validation/DB/3YQQ1BZ8PGNK11YAB4UE9OCKZK0CWM/view.html

[29] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2976

Ⅱ. Calculate the Project Emission（PE_y）
Ⅲ. Calculate the Leakage Emission（LE_y）
Ⅳ. Calculate the Emission Reductions（ER_y）

Ⅰ. Calculate the Baseline Emission （BE_y）

The baseline emission (BE_y) is the product of the baseline emission factor ($EF_{grid,CM,y}$) times the electricity supplied by the proposed project to the grid ($EG_{PJ,y}$), calculated as follows:
Step 1 – Calculate the Baseline Emission Factor
Step 2 – Calculate the Baseline Emission

Step 1 – Calculate the Baseline Emission Factor

According to the *tool to calculate the emission factor for an electricity system*, the baseline emission factor is calculated as a Combined Margin (CM), which is consisting of the weighted average of Operating Margin emission factor and Build Margin emission factor by utilizing an Ex-ante 3 years data vintage for the Northeast China Grid, calculated as the following 6 sub-steps:
Sub-step 1. Identify the relevant electric power system.
Sub-step 2. Select an operating margin (OM) method.
Sub-step 3. Calculate the operating margin emission factor according to the selected method.
Sub-step 4. Identify the cohort of power units to be included in the build margin (BM).
Sub-step 5. Calculate the build margin emission factor.
Sub-step 6. Calculate the combined margin (CM) emissions factor.

Sub-step 1. Identify the relevant electric power system.

According to the division of the electric power system from *2008 Baseline Emission Factors for Regional Power Grids in China* by China's DNA, the electric power system of the proposed project is the Northeast China Grid.

Sub-step 2. Select an operating margin (OM) method.

Based on one of the four following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

The detailed data and the load curve of the Northeast China Grid are not available to be obtained by public. Therefore, the Dispatch Data Analysis OM method and the Simple Adjusted OM method are not applicable.

Among the total electricity generations in 2002-2006 of the Northeast China Grid, the low-cost/must run resources constitute less than 50% of total amount grid generating output (see Annex 3 for details). Therefore, the Simple OM method can be used to calculate the OM emission factor.

Sub-step 3. Calculate the operating margin emission factor according to the selected method.

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. It may be calculated:

a. Based on data on fuel consumption and net electricity generation of each power plant/unit, or
b. Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, or
c. Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The detailed data of each plant/unit connected to the Northeast China Grid are not available to be obtained by public. Therefore, the option a and option b are not applicable. Option c is selected to calculate the operating margin emission factor.

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

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

Where:

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

$NCV_{i,y}$ =Net calorific value (energy content) of fossil fuel type *i* in year *y* (TJ/mass or volume unit)

$EF_{CO_2,i,y}$ =CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/TJ)

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

i =All fossil fuel types combusted in power sources in the project electricity system in year *y*

y =The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option).

Sub-step 4. Identify the cohort of power units to be included in the build margin (BM).

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

a. The set of five power units that have been built most recently, or
b. The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprises the larger annual generation.

The information on the five power plants built most recently in the Northeast China Grid is not publicly available. Therefore, option b is selected to identify the cohort of power units to be included in the build margin.

For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build

margin emission factor calculated for the second crediting period should be used. It does not require monitoring the emission factor during the crediting period.

Sub-step 5. Calculate the build margin emission factor.

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

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

Where:
$EG_{m,y}$ =Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$=CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
m = Power units included in the build margin
y =Most recent historical year for which power generation data is available.

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as the follows:
a. Based on the data on fuel consumption and electricity generation, or
b. Based on the data on electricity generation and the fuel types used, or
c. Based on the data on electricity generation.

Option a is selected to determine the emission factor $EF_{EL,m,y}$, calculated as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}} \quad (3)$$

Where:
$FC_{i,m,y}$ =Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (mass or volume unit)
$NCV_{i,y}$ =Net calorific value (energy content) of fossil fuel type *i* in year *y* (TJ/mass or volume unit)
$EF_{CO2,I,y}$ =CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/TJ)
$EG_{m,y}$ =Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m =All power units serving the grid in year y except low-cost/must-run power units
I =All fossil fuel types combusted in power unit *m* in year *y*
y =the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)

Then, the build margin emission factor is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{i,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum_m EG_{m,y}} \quad (4)$$

The parameters used in formula (4) are defined as that in formula (3) above.

EB guidance on the application of approved methodology AM0005 now consolidated into ACM0002 can be applied for the purposed of estimating the build margin emission factor for each fuel type[30].

Deleted: [26]

[30] http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM

According to the cohort of power units identified to be included in the build margin, the proposed deviations accepted and the alternative solutions in absence of data were as follows: 1) It is agreed to use the new capacity additions during the past 1-3 years to calculate the Build Margin emission factor. Thereinto, the annual new capacity additions, which ended up calculated more close to 20% in the total installed capacity of the grid during the last 1-3 years, should be adopted; 2) It is agreed that the use of the installed capacity to replace the annual electricity generation to calculate the build margin emission factor; 3) As a similar conservative estimation, calculate the total fuel consumption of different fuel-fired power plants by utilization of the most advanced commercialized technologies.

Due to the difficulty of separating the coal-fired, gas-fired or oil-fired installed capacity from the total fuel-fired installed capacity, according to the suggestion on the alternative solutions in absence of data by CDM EB, the Build Margin emission factor will be calculated as : 1) Based on the most recent year's energy balance of the Northeast China Grid, calculating the proportions of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions; 2) based on the most advanced commercialized technologies which applied by the coal-fired, oil-fired and gas-fired power plants, calculating the fuel-fired emission factor of the Northeast China Grid; 3) calculating the build margin emission factor $EF_{grid,BM,y}$ through fuel-fired emission factor times the weighted-average of fuel-fired installed capacity which is more close to 20% in the new capacity additions. The detailed calculation as follows:

Sub-Step 5a. Calculating the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions.

$$\lambda_{Coal} = \frac{\sum_{i \in Coal, j} \mathrm{EF}_{\mathrm{CO2,i},y} \times \mathrm{NCV}_{i,y} \times \mathrm{FC}_{\mathrm{i,j,y}}}{\sum_{i,j} \mathrm{EF}_{\mathrm{CO2,i},y} \times \mathrm{NCV}_{i,y} \times \mathrm{FC}_{\mathrm{i,j,y}}} \quad (5)$$

$$\lambda_{\mathrm{Oil}} = \frac{\sum_{i \in \mathrm{Oil}, j} \mathrm{EF}_{\mathrm{CO2,i},y} \times \mathrm{NCV}_{i,y} \times \mathrm{FC}_{\mathrm{i,j,y}}}{\sum_{i,j} \mathrm{EF}_{\mathrm{CO2,i},y} \times \mathrm{NCV}_{i,y} \times \mathrm{FC}_{\mathrm{i,j,y}}} \quad (6)$$

$$\lambda_{\mathrm{Gas}} = \frac{\sum_{i \in \mathrm{Gas}, j} \mathrm{EF}_{\mathrm{CO2,i},y} \times \mathrm{NCV}_{i,y} \times \mathrm{FC}_{\mathrm{i,j,y}}}{\sum_{i,j} \mathrm{EF}_{\mathrm{CO2,i},y} \times \mathrm{NCV}_{i,y} \times \mathrm{FC}_{\mathrm{i,j,y}}} \quad (7)$$

Where:
$FC_{i,j,y}$ = Amount of fossil fuel type *i* consumed by the province *j* in year *y* (mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (TJ/mass or volume unit)
$EF_{CO2,I,y}$ =CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/TJ)
λ_{Coal} = the percentage of CO_2 emissions from the coal-fired power plants in total fuel-fired CO_2 emissions;
λ_{Oil} = the percentage of CO_2 emissions from the oil-fired power plants in total fuel-fired CO_2 emissions;
λ_{Gas} = the percentage of CO_2 emissions from the gas-fired power plants in total fuel-fired CO_2 emissions;

Sub-Step 5b. Calculating the fuel-fired emission factor

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

Where:
$EF_{Thermal}$ = the fuel-fired emission factor;
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are corresponding to the emission factors of coal, oil and gas fired power plants which are applied by the most advanced commercialized technologies:

$$\mathrm{EF}_{Coal,Adv} = \frac{3.6 \times \mathrm{EF}_{\mathrm{CO2,i,y}} \times 44}{\mathrm{FCR}_{Coal,Adv} \times 1000 \times 12} (\mathrm{i} \in \mathrm{Coal}) \quad (9)$$

$$\mathrm{EF}_{\mathrm{Oil},Adv} = \frac{3.6 \times \mathrm{EF}_{\mathrm{CO2,i,y}} \times 44}{\mathrm{FCR}_{\mathrm{Oil},Adv} \times 1000 \times 12} (\mathrm{i} \in \mathrm{Oil}) \quad (10)$$

$$\mathrm{EF}_{\mathrm{Gas},Adv} = \frac{3.6 \times \mathrm{EF}_{\mathrm{CO2,i,y}} \times 44}{\mathrm{FCR}_{\mathrm{Gas},Adv} \times 1000 \times 12} (\mathrm{i} \in \mathrm{Gas}) \quad (11)$$

$FRC_{\mathrm{Coal,Adv}}$, $FRC_{\mathrm{Oil,Adv}}$, and $FRC_{\mathrm{Gas,Adv}}$ is the fuel consumption rate of coal, oil and gas fired power plants which are applied by the most advanced commercialized technologies.

Sub-Step 5c. Calculating the Build Margin Emission Factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (12)$$

Where:
$EF_{grid,BM,y}$ = the build margin emission factor with advanced commercialized technologies in year *y*;
CAP_{Total} = the new capacity additions;
$CAP_{Thermal}$ = the new fuel-fired capacity additions.

Sub-step 6. Calculate the combined margin (CM) emissions factor.

$$EF_y = \omega_{OM} \cdot EF_{grid,OM,y} + \omega_{BM} \cdot EF_{grid,BM,y} \quad (13)$$

Where:
the weights ω_{OM} =0.75; ω_{BM} = 0.25 by default.

Step 2 – Calculate the Baseline Emission

$$\mathrm{BE}_y = \mathrm{EF}_{\mathrm{grid,CM,y}} \times (\mathrm{EG}_{\mathrm{PJ},y} - \mathrm{EG}_{baseline,y}) \quad (14)$$

Where:
$EF_{grid,CM,y}$ =combined margin CO_2 emission factor for grid connected power generation in year *y*
$EG_{baseline,y}$ =baseline electricity supplied to the grid. For new power plants this value is taken as zero.
$EG_{PJ,y}$ =net electricity supplied by the project activity to the grid (MWh), calculated as the difference of the electricity supplied by the project activity to the Northeast China Grid ($EG_{PJ\ to\ grid,y}$)and the electricity supplied by the Northeast China Grid to the project activity ($EG_{grid\ to\ PJ,y}$). Namely, $EG_{PJ,y}=EG_{PJ\ to\ Grid,y} - EG_{Grid\ to\ PJ,y}$

Ⅱ. Calculate the Project Emission（PE_y）

According to the methodology, as a windpower project, there are no expected project emissions related to the electricity generation. Therefore, $PE_y = 0$.

Ⅲ. Calculate the Leakage Emission（LE_y）

According to the methodology, as a wind power project, there are no expected leakage emissions related to the electricity generation. Therefore, $LE_y = 0$.

Ⅳ. Calculate the Emission Reductions（ER_y）

The emission reduction ER_y due to the proposed project activity during a given year *y* is calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (15)$$

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

Data / Parameter:	$FC_{i,j,y}$
Data unit:	10^4t, 10^7m^3
Description:	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*
Source of data used:	China Energy Statistical Yearbook 2005-2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data that is collected from the official statistics.
Any comment:	

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tCO_2/TJ
Description:	the CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	*"2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy, Chapter 1.*
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures	Data that is collected from the IPCC because the local data is not available.

actually applied :	
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ/ mass or volume unit of a fuel
Description:	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook 2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Local values
Any comment:	

Data / Parameter:	*Installed Capacity*
Data unit:	MW
Description:	Installed capacities of the Northeast China Grid
Source of data used:	China Electric Power Yearbook 2000-2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data that is collected from the official statistics.
Any comment:	

Data / Parameter:	EG_y
Data unit:	MWh
Description:	The net electricity generated by power source in Northeast China Grid in year *y*, not include low-cost/must-run power plants/units
Source of data used:	China Electric Power Yearbook 2003-2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data that is collected from the official statistics.
Any comment:	

Data / Parameter:	*Auxiliary Power Ratio*
Data unit:	%
Description:	The auxiliary power ratio of power source in Northeast China Grid in year *y*, not include low-cost/must-run power plants/units

Source of data used:	China Electric Power Yearbook 2005-2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data that is collected from the official statistics.
Any comment:	

Data / Parameter:	$FCR_{coal,\ Adv}$
Data unit:	
Description:	The fuel consumption rate of coal-fired power plants which are applied by the most advanced commercialized technologies.
Source of data used:	*2008 Baseline Emission Factors for Regional Power Grids in China* from China's DNA
Value applied:	37.28%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data that is collected from the official statistics.
Any comment:	

Data / Parameter:	$FCR_{Oil,\ Adv}$
Data unit:	
Description:	The fuel consumption rate of oil-fired power plants which are applied by the most advanced commercialized technologies.
Source of data used:	*2008 Baseline Emission Factors for Regional Power Grids in China* from China's DNA
Value applied:	48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data that is collected from the official statistics.
Any comment:	

Data / Parameter:	$FCR_{Gas,\ Adv}$
Data unit:	
Description:	The fuel consumption rate of gas-fired power plants which are applied by the most advanced commercialized technologies.
Source of data used:	*2008 Baseline Emission Factors for Regional Power Grids in China* from China's DNA
Value applied:	48.81%

Justification of the choice of data or description of measurement methods and procedures actually applied :	Data that is collected from the official statistics.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

I. Baseline Emission

According to the conservative manner, the Operating Margin emission factor ($EF_{grid,OM,y}$) is the weighted emission factors of 2004–2006:

$EF_{grid,OM,y}$ =1.2561 tCO_2e/MWh

The result of the Build Margin emission factor is:
$EF_{grid,BM,y}$=0.7946 tCO_2e/MWh

The baseline emission factor $EF_{grid,CM,y}$ is:
$EF_{grid,CM,y}$ = 0.75×1.2561+0.25×0.7946=1.1408 tCO_2e/MWh

The baseline emission BE_y is:
BE_y =1.1408×110,458=126,010 tCO_2e /year

See annex 3 for details.

II. Project Emission

PE_y = 0.

III. Leakage Emission

LE_y=0.

IV. Emission Reduction

The Emission Reductions (ER_y) for the proposed project activity is:
ER_y =126,010-0-0 = 126,010 tCO_2e /year

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

Year	Estimation of project activity 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)
Sep. 2009-Aug. 2010	0	126,010	0	126,010
Sep. 2010-Aug. 2011	0	126,010	0	126,010
Sep. 2011-Aug. 2012	0	126,010	0	126,010
Sep. 2012-Aug. 2013	0	126,010	0	126,010
Sep. 2013-Aug. 2014	0	126,010	0	126,010
Sep. 2014-Aug. 2015	0	126,010	0	126,010
Sep. 2015-Aug. 2016	0	126,010	0	126,010
Total (tonnes of CO_2e)	0	882,070	0	882,070

Note: The starting date of the first crediting period is September 1, 2009, and the deadline is August 31, 2016.

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	Net electricity supplied by the project to the NECG
Source of data to be used:	Measured by ammeters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	110,458 MWh
Description of measurement methods and procedures to be applied:	The electricity supplied by the project to the NECG and the electricity supplied by the NECG to the project are measured by the main meter installed at the 66kV step-up station according to the Power Purchase Agreement (PPA). The measurement will be continuously carried out and monthly recorded; 100% of data will be monitored and electronic archived. The 66kV line losses will be considered and it will be subtracted from the net electricity supplied by the project to the NECG for conservativeness during verification.
QA/QC procedures to be applied:	The measurement will in compliance with the National Guidelines and requirements of the grid company for accuracy and reliability. The calibration will be carried out yearly by a qualified metrical organization co-authorized by the owner and the grid company.
Any comment:	Double checked by receipt of sales.

Data / Parameter:	$EG_{substation}$
Data unit:	MWh
Description:	The electricity supplied to the grid through the same transmission line and recorded by the meter installed at the substation.
Source of data to be used:	Measured by ammeters

Value of data applied for the purpose of calculating expected emission reductions in section B.5	110,458 MWh
Description of measurement methods and procedures to be applied:	The electricity supplied to the grid through the same transmission line and recorded by the meter installed at the substation. The measurement will be continuously carried out and monthly recorded. The data will be provided by the grid company monthly.
QA/QC procedures to be applied:	The measurement will in compliance with the National Guidelines and requirements of the grid company for accuracy and reliability. The calibration will be carried out periodically by a qualified metrical organization.
Any comment:	

Data / Parameter:	EG_i
Data unit:	MWh
Description:	the electricity supplied by the project i to the NECG through the same transmission line
Source of data to be used:	Measured by ammeters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0 MWh
Description of measurement methods and procedures to be applied:	The electricity supplied by the project i to the NECG through the same transmission line and recorded by the meter installed at the project i. The measurement will be continuously carried out and monthly recorded. The electricity supplied by the project i to the NECG of every month will be provided by the grid company.
QA/QC procedures to be applied:	The measurement will in compliance with the National Guidelines and requirements of the grid company for accuracy and reliability. The calibration will be carried out periodically by a qualified metrical organization.
Any comment:	The data is used only when there is a wind farm connecting to the same transmission line. So as far, there is no wind farm connecting to the same transmission line.

B.7.2 Description of the monitoring plan:

This monitoring plan is to serve as a guideline for the project owner. The contents of the Monitoring Plan are highlighted as follows:

1. Key data to be monitored

The net electricity supplied by the project to the NECG, which is the difference of the electricity supplied by the project to the NECG, the electricity supplied by the NECG to the project and the 66kV line loss

for conservativeness, is the key data for determining the CERs produced by the proposed project. Hence, two key data need to be monitored:

- The electricity supplied by the project to the NECG
- The electricity supplied by the NECG to the project

2. Metering Systems

2.1 The electricity supplied by the project to the NECG

A main metering system and a backup metering system will be used to monitor the electricity supplied by the project to the NECG. According to the Power Purchase Agreement (PPA), the main metering system will be installed at the 66kV step-up station and the metering system installed at Beipiao 220kV transmission substation is the backup system when the main metering system is out of order. The grid company requires the project owner to share the line loss, which is still in discussion between the grid company and the project owner. The project owner agrees to subtract the line loss from the net electricity supplied by the project to the NECG for conservativeness during verification.The metering systems are consisted of the electric meters and accessories, and designed and operated in compliance with the national guideline (DL/T448-2000). The metering systems will be cross-checked by the project owner and the Grid Company before operation. The accuracy of the metering system is 0.2S degree.

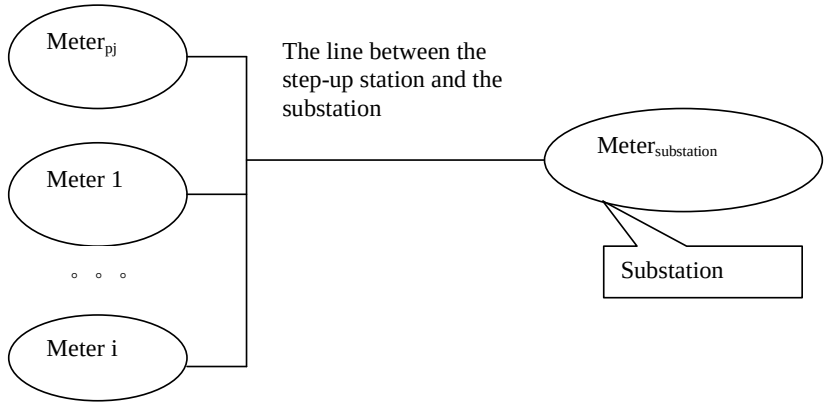
2.2 The electricity purchased by the project from the NECG

A metering system will be installed at the 66kV step-up station to monitor the electricity supplied by the NECG to the project. The metering system is consisted of the electric meters and accessories, and designed and operated in compliance with the related national guideline (DL/T448-2000).

2.3 The line losses between the step-up station and the substation

According to the Plan of the grid company, there may be wind farms connecting to the NECG through the same line in the future. Therefore, the process of monitoring the line losses between the step-up station and the substation is described as follows, which has been agreed by the grid company and the project owner.

Metering diagram



Meter$_{pj}$ is the meter installed at the 66kV step-up station of the proposed project;

Meter i (i=1,2, …, i) is installed at the project i and measured the electricity supplied by the project i to the NECG;

Project i is the project used the same transmission line to connect to the NECG.
$Meter_{substation}$ is installed at the substation to measure the electricity supplied to the grid through the same transmission line.

Then the line losses shared by the project
$L_{pj}=(EG_{pj\ to\ grid}+EG_1+\ldots+EG_i - EG_{substation}) * EG_{pj\ to\ grid}/(EG_{pj\ to\ grid}+EG_1+\ldots+EG_i)$

Where：
L_{pj} is the line losses shared by the proposed project;
$EG_{pj\ to\ grid}$ is the electricity supplied by the proposed project to the NECG;
EG_i is the electricity supplied by the project i to the NECG through the same transmission line and measured by the Meter i;
$EG_{substation}$ is the net electricity supplied to the grid through the same transmission line and recorded by the meter installed at the substation.

So as far, there is no project connect to the NECG through the same transmission line. Therefore, the
$L_{pj}= EG_{pj\ to\ grid} - EG_{substation}$
The grid company supplies the value of $EG_{substation}$ to the project owner to calculate the line losses between the step-up station and the substation.
If there are other projects connecting to the NECG through the same line in the future. The grid company will supply the value of EG_i and the value of $EG_{substation}$ to calculate the line losses according to the above formula.

3. Data Collection and Reporting

The data will be hourly measurement and monthly recording, collection and archive. Two methods will be used to measure and record the data: hand-log, and automatic log.
In the month of CDM registration, the grid company will read the meter and record data on the registration day of the project, if the date of registration is later than that of starting operation.
The grid company reads the meter and records data on the appointed day of every month, supplies readings to the project owner and provides relevant documents.
Project owner saves the data of net electricity supplied by the project to the NECG and provides the meter’s readings and photocopies of invoices to DOE for verification.

4. Calibration and Accidence Treatment of Meter and Metering

The calibration of the electric meters will be yearly carried out by a qualified metrical organization co-authorized by the owner and the grid company. After the calibration, the metering system should be jointly inspected and sealed on the behalf of the parties concerned and shall not be accessible by either party except in the presence of the other party or its accredited representatives.

If following works for the metering systems of the net electricity supplied by the project to the NECG happen: remove, replacement, disassembling, sealing, seal-breaking, accident treatment and etc, the grid company is the responsible operator, and the representative of the project owner should attend.

QC/QA:
Data and records will be checked prior to being archived. The data will be double checked by the metering system and sales receipts.

If the parties have dissidence on the operation of the metering system, the metering system will be calibrated by the qualified metrical organization co-authorized by both parties. Both parties will decide the amount of electricity depending on the results of the calibration and relevant regulations. If the parties have dissidence on the calibration results, a high qualification metrical organization will be authorized to re-calibrate the meters.

If any accident happened in the metering systems, or the percentage of data difference between the records of the metering systems is larger than the sum of the accuracy of both metering systems, the electricity should be determined by following:

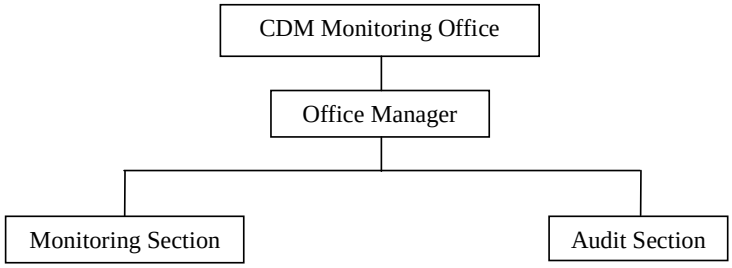
(1) If both metering system have no failure, the electricity will be the average of the records of both system;
(2) If the main metering system has failure but the backup system is working, the electricity will be determined by the record of the backup system;
(3) If the backup system has failure but the main system is working, the electricity will be determined by the record of the main system;
(4) If both systems have failure, the electricity should be determined by the records of other metering points with the consideration of the line loss ratio or the auxiliary power ratio, or other measurements agreed by both parties.

Maintenance records and any calibration documents will be retained by the project owner and available for the DOE.

5. The Operational and Management Structure for Monitoring

Prior to the start of the crediting period, the project owner will set up a CDM Monitoring Office and designate a qualified staff responsible for all relevant matters, including monitoring, data collection and archiving, QC/QA, and verification. The structure of the CDM Monitoring Office is outlined in Figure B–3.

Figure B–3 Organization Chart of the CDM Project Management Office



The responsibilities of the sections are briefly described as following:

- Office Manager: Manage the work of CDM Monitoring Office; in charge of all relevant matters with the monitoring activity.
- Monitoring Section: Monitor, collect and archive the data according to the Monitoring Plan.
- Audit Section: Audit the work of Monitoring Section and execute the QC/QA procedures according to the Monitoring Plan.

In addition, the CDM staff training system will be established. The CDM office manager will manage the process of training staff. All staff involved in the CDM project will receive some periodic training to collect and archive complete and accurate data for CDM monitoring from CPCEC CDM Development Centre. Records of trained CDM staff will be retained by the project owner. The CDM office manager will ensure that only trained staff is involved in the operation of the monitoring system. Further details of the training procedure will be available for the DOE.

6. Data Management System

Under the monitoring system, a data management system will be setup for keeping data and information, and tracking information from the primary source to data calculation, in paper format. It is the responsibility of the owner to provide additional necessary data, information and document for validation and verification requirements of respective DOE.

Paper documentation such as maps, diagrams and environmental assessment will be collected in a central place, together with this monitoring plan. In order to facilitate auditor's reference, monitoring results should be indexed. All paper information will be stored by the owner and kept at least one copy.

The data monitored and required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of CERs for this proposed project activity, whatever occurs later.

7. Verification

The owner will make the arrangements for the verification to the best of its abilities. The owner will facilitate the verification by providing the DOE all required necessary information before, during and after the verification.

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

Date of completion: 20/09/ 2008

Name of persons determining the baseline study and monitoring methodology:
Miss. Meng Jing, CDM Development Centre of CPCEC,
E-mail: mengjing@cpcec.com, Tel: +86 10 85285120.

Neither CPCEC nor its employees are project participants.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
As the timeline described in B.5, the date of starting construction is 20/09/2007, the date of signing the wind turbine generator purchasing contract is 26/09/2007. So, the date of starting construction is earlier.

20/09/2007 (the date of starting construction)

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

>>
20 years, 0 month

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:

>>
01/09/2009 or the date of registration, whichever is later

C.2.1.2. Length of the first crediting period:

>>
7 years, 0 month

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

>>

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

>>
The proposed project EIA was carried out by Liaoning Academy of Environmental Sciences and approved by Liaoning Environmental Protection Administration. The evaluation is summarized as follows:

1. NOISE AND PRECAUTIONS

The noise during construction period will be mainly caused by instruments and vehicles. The project owner will take the following measurements to reduce these impacts:

- Use low-noise instruments and set instruments with high noise far away from the villages;
- Strengthen machine maintenance, control the speed of vehicle and forbid hoot to reduce the noise;
- Provide helmets and ear-muffs for the workers.

The noise during the operation period will be mainly caused by the generator operation. According to

Feasibility Study Report, the generators will be lay out 446m away from the residential area, and the noise will be in accordance with the standard Ⅰof *Standard of noise in cities*(GB3096-93). Therefore, the noise influence is negligible.

2. WASTE AND PRECAUTIONS

Waste is sourced from construction, the household trash and sewage. During the construction period, a completed protection system, including backfilling the earth and stone digged out, taking measures to dispose waste in the designated disposal area, implementing the wet working method and etc., will be designed and established to prevent the impacts. The household trash and sewage will be collected and disposed with the surrounding residential area.

3. ECOSYSTEM

The project owner pays much attention and takes the following measurements to protect ecosystem around the proposed project,

- Backfill the surface soil after digging to protect surface vegetation and soil to its original state.
- Lay generators and instruments at the designated place.
- Afforesting the occupied areas after construction.

4. OTHER INFLUENCE AND PRECAUTIONS

The height of the generators is 105m and the height of the shadow is about 240m. The proposed project is more than 446m away from the nearest residential area. Therefore, the shadow influence is negligible.
According to investigation on the built wind farms, the influence of the electromagnetic radiation and radio jamming produced by the proposed project will be lower than the national standard. Therefore, the influences can be negligible.
According to the statistics, Beita County is not on the route of the birds' migration, and there are no endangered birds in the site of the proposed project. Moreover, the flight height of birds is above 200m, over the height of the generator; therefore, the influence on birds is negligible.

5. Conclusion

After the above measurements performed, the negative impacts on environments will be minimized below the national standard. Furthermore, as a renewable power project, the proposed project can reduce the consumption of fossil fuel and GHG emission. In addition, the operation of the proposed project will improve the development of the local tourism.

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:

>>

According to EIA, no significant environmental impacts are discovered by the project participants or the host party. Liaoning Environmental Protection Administration has been approved the EIA.

SECTION E. Stakeholders' comments

>>

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

>>

To investigate impacts on local ecological environment, the project owner made a survey among the potential stakeholders, mostly including the local residents and local government, in the formats of questionnaires, newspaper and notification.

1. Investigating stakeholders through questionnaires

The project owner arranged a survey through the questionnaires. There are 67 questionnaires distributed and 67 questionnaires had been returned. The whole process of the delivery and collection of the questionnaires are completed by the project owner in March, 2007.

The investigated stakeholders include residents, technicians and local government officials.

The questions in the questionnaires including:

- Do you support the construction of the proposed project?
  □ Support □ Objection □ Indifferent
- What do you think the influence on the conditions of the noise?
  □ much □No □ I do not know
- What do you think the influence on the conditions of the local ecosystem?
  □ much □No □ I do not know
- What do you think the influence on the local economy?
  □ much □No □ I do not know
- Have you ever heard of CDM?
  □ Yes □ Never
- Do you support the proposed project applying for CDM project?
  □ Support □ Objection □ Indifferent
- What do you think about the proposed project?

2. Collecting suggestions through newspaper and notification

To ensure wide participation of stakeholders, a stakeholder consultation was organized through the following channels:

- From February to May, 2007, the project owner publicize the notification to collecting suggestions on Beipiao newsletter;
- From December, 2006 to January, 2007, the project owner put up notifications in the call-board of Beita County.

The notification contained the introduction of the project and CDM, and comments can be accessed through telephone.

E.2. Summary of the comments received:

>>

1. Comments from the questionnaires

The survey shows that the majority of local residents have some knowledge about wind power projects. Of all the investigated stakeholders, 100% support the construction of the proposed project; over 90% think the construction of the proposed project will prompt the local economic development and the living condition. The stakeholders think that the impacts on the environment only occur during construction

period. It is temporary and can minimize after the construction. Therefore, nobody is afraid of the negative influences.

2. Comments received through newspaper and notification:

During the process of investigation, the local government sent a letter to support the construction of the proposed project. The letter is summarized as follows:
The proposed project is a renewable power project and accord with the development of renewable energy in Liaoning Province. The proposed project not only protects the local ecosystem efficiently and reduces the emission of Greenhouse Gas, but also prompts the local economic development and provides job opportunities. The government and authorities at all levels support the project construction and wish the construction could be operated early.

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

>>

The residents and local government are all very supportive to the proposed project. There are no objections received during the investigation. The project owner will put proper measures into effect as described in the EIA during construction and operation to minimize the negative impacts on environments and Liaoning Environmental Protection Administration will answer for supervising the fulfillment of the environmental protection measures.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I parties is involved in this project activity.

Annex 3

BASELINE INFORMATION

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

The Emission Factor, and Average Low Caloric Value applied in the calculation of the Operating Margin and Build Margin emission factor are listed in table 1.

Table 1 Related Parameters

Fuel	Emission Factor [1] （tc/TJ）	Average Low Caloric Value [2]
	H	I
Raw Coal	25.8	20908 MJ/t
Cleaned Coal	25.8	26344 MJ/t
Other Washed Coal	25.8	8363 MJ/t
Coke	29.2	28435 MJ/t
Coke Oven Gas	12.1	16726 MJ/km^3
Other Gas	12.1	5227 MJ/km^3
Crude Oil	20	41816 MJ/t
Gasoline	18.9	43070 MJ/t
Kerosene	19.6	43070 MJ/t
Diesel Oil	20.2	42652 MJ/t
Fuel Oil	21.1	41816 MJ/t
PLG	17.2	50179 MJ/t
Refinery Gas	15.7	46055 MJ/t
Natural Gas	15.3	38931 MJ/km^3
Other Petroleum Products	20	38369 MJ/t
Other Coking Products	25.8	28435 MJ/t
Other Energy	0	0

Source：1 "2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy, Chapter 1.

2 China Energy Statistical Yearbook 2007

Table 2 Electricity Generation of the Northeast China Grid (2002-2006)

Year	Electricity Generation (MWh)			Split of Thermal
	Hydro	Thermal	Total	
2002	8015000	141545000	149683000	94.56%
2003	7568000	157983000	165817000	95.28%
2004	11432000	171267000	183090000	93.54%
2005	15528000	176991000	192963000	91.72%
2006	11213000	199214000	211237000	94.31%

Sources: China Electric Power Yearbook 2003-2007

Table 3 Calculating CO_2 Emission of the Northeast China Grid in 2004

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Total	CO_2 Emission（tCO_2e）
		A	B	C	G=A+B+C	K=G*H*I* 44/12/100 (mass) K=G*H*I* 44/12/10 (volume)
Raw Coal	10^4t	4144.2	2310.9	3084.8	9539.9	188689376.8
Cleaned coal	10^4t	84.75	1.09	4.88	90.72	2260871.585
Other Washed Coal	10^4t	577.67	14.26	61	652.93	5165589.096
Coke	10^4t	0	0	0	0	0
Coke Oven Gas	10^8m^3	4.83	2.91	0	7.74	574367.4948
Other Gas	10^8m^3	57.33	4.19	0	61.52	1426676.894
Crude Oil	10^4t	0	0	0	0	0
Gasoline	10^4t	0	0	0	0	0
Diesel Oil	10^4t	2.04	1.16	0.24	3.44	108672.7465
Fuel Oil	10^4t	12.81	1.78	2.86	17.45	564536.2111
PLG	10^4t	2.19	0	0	2.19	69305.22764
Refinery Gas	10^4t	9.79	0	1.14	10.93	289779.7487
Natural Gas	10^8m^3	0	0.03	2.53	2.56	559111.4496
Other Petroleum Products	10^4t	0	0	0	0	0
Other Coking Products	10^4t	0	0	0	0	0
Other Energy	10^4t tce	26.97	5.07	0	32.04	0
Total						199708287.3

Sources: China Energy Statistical Yearbook 2005

Table 4 Electricity Generation of Fuel-fired power plants of the NECG in 2004

	Electricity generation of fuel-fired power plants （MWh）	Auxiliary power ratio （%）	Electricity Supply （MWh）
Liaoning	84543000	7.21	78447450
Jilin	33242000	7.68	30689014
Heilongjiang	53482000	7.84	49289011
Total			158425475

Sources: China Electric Power Yearbook 2005

Therefore, the OM emission factor of the NECG is
$EF_{grid,OM,,2004}$=199708287.3/158425475=1.2606 tCO_2/MWh

Table 5 Calculating CO_2 Emission of the Northeast China Grid in 2005

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Total	CO_2 Emission（tCO_2e）
		A	B	C	G=A+B+C	K=G*H*I *44/12/100 (mass) K=G*H*I *44/12/10 (volume)
Raw Coal	10^4t	4305.41	2446.13	3383.21	10134.75	200454895.9
Cleaned coal	10^4t	0	0	0	0	0
Other Washed Coal	10^4t	524.74	19.26	24.16	568.16	4494939.9
Coke	10^4t	0	0	0	0	0
Coke Oven Gas	10^8m^3	1.03	3.57	0.68	5.28	391816.5856
Other Gas	10^8m^3	12.62	8.37	0	20.99	486767.6854
Crude Oil	10^4t	1.16	0	0	1.16	35571.4773
Gasoline	10^4t	0	0	0	0	0
Diesel Oil	10^4t	1.18	1.48	0.57	3.23	102038.6544
Fuel Oil	10^4t	9.32	2.46	1.55	13.33	431247.4323
PLG	10^4t	0.12	0	0	0.12	3797.5467
Refinery Gas	10^4t	5.48	0	1.32	6.8	180283.8327
Natural Gas	10^8m^3	0	0.84	2.24	3.08	672680.9628
Other Petroleum Products	10^4t	0	0	0	0	0
Other Coking Products	10^4t	0	0	0	0	0
Other Energy	10^4t tce	16.18	0	0	16.18	0
Total						207254040.0029

Sources：China Energy Statistical Yearbook 2006

Table 6 Electricity Generation of Fuel-fired power plants of the NECG in 2005

	Electricity generation（MWh）	Auxiliary power ratio（%）	Electricity Supply（MWh）
Liaoning	83697000	7.03	77813101
Jilin	35294000	6.59	32968125
Heilongjiang	58000000	7.96	53383200

Total			164164426.3

Sources: China Electric Power Yearbook 2006

Therefore, the OM emission factor of NECG is
$EF_{grid,OM,2005}$=207254040.0029/164164426.3=1.2625 tCO_2/MWh

Table 7 Calculating CO_2 Emission of the Northeast China Grid in 2006

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Total	CO_2 Emission（tCO_2e）
		A	B	C	G=A+B+C	K=G*H*I* 44/12/100 (mass) K=G*H*I* 44/12/10 (volume)
Raw Coal	10^4t	4681.99	2738.24	3698.29	11118.52	219912851.2874
Cleaned coal	10^4t	0.03	0	0	0.03	747.6427
Other Washed Coal	10^4t	674.74	17.83	96	788.57	6238691.1209
Coke	10^4t	3.32	0	0	3.32	101075
Coke Oven Gas	10^8m^3	2.68	0.16	1.44	4.28	317608.8989
Other Gas	10^8m^3	55.26	1.43	0	56.69	1314666.9884
Crude Oil	10^4t	0.49	0	0	0.49	15025.8827
Gasoline	10^4t	0	0	0	0	0
Diesel Oil	10^4t	0.75	0.39	0.3	1.44	45490.91712
Fuel Oil	10^4t	11.73	0.45	1.44	13.62	440629.4094
PLG	10^4t	0	0	0	0	0
Refinery Gas	10^4t	8.55	0	4.27	12.82	339888.0492
Natural Gas	10^8m^3	0	0.19	2.1	2.29	500142.6639
Other Petroleum Products	10^4t	0	0	0	0	0
Other Coking Products	10^4t	0	0	0	0	0
Other Energy	10^4t tce	12.16	17.6	82.77	112.53	0
Total						229226818.2908

Sources: China Energy Statistical Yearbook 2007

Table 8 Electricity Generation of Fuel-fired power plants of the NECG in 2006

	Electricity generation of fuel-fired	Auxiliary power ratio（%）	Electricity Supply（MWh）

	power plants（MWh）		
Liaoning	96282000	6.62	89908131.6
Jilin	38576000	6.78	35960547.2
Heilongjiang	62964000	7.85	58021326
Total			183890004.8

Sources: China Electric Power Yearbook 2007

Therefore, the OM emission factor of NECG is
$EF_{grid,OM,2006}$=229226818.2908/183890004.8=1.2465 tCO_2/MWh

Therefore, $EF_{grid,OM,y}$
=199708287.3+207254040.0029+229226818.2908/158425475.3+164164426.3+183890004.8
=1.256099 tCO_2/MWh

Step 2 – Calculation of the Build Margin Emission Factor ($EF_{grid,BM,y}$)

Sub-Step 2a. Calculating the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions.

Table 9 the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions of the NECG in 2006

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Total	CO_2 Emission（tCO_2e）
		A	B	C	G=A+B+C	K=G*H*I *44/12/100
Raw Coal	10^4 t	4681.99	2738.24	3698.29	11118.52	219912851
Cleaned coal	10^4 t	0.03	0	0	0.03	748
Other Washed Coal	10^4 t	674.74	17.83	96	788.57	6238691
Coke	10^4 t	3.32	0	0	3.32	101075
Subtotal						226253365
Crude Oil	10^4 t	0.49	0	0	0.49	15025.88267
Gasoline	10^4 t	0	0	0	0	0
Kerosene	10^4 t	0	0	0	0	0
Diesel Oil	10^4 t	0.75	0.39	0.3	1.44	45491
Fuel Oil	10^4 t	11.73	0.45	1.44	13.62	440629
Other Petroleum Products	10^4 t	0	0	0	0	0
Subtotal						501146
Natural Gas	$10^7 m^3$	0	1.9	21	22.9	500143
Coke Oven Gas	$10^7 m^3$	26.8	1.6	14.4	42.8	317609
Other Gas	$10^7 m^3$	552.6	14.3	0	566.9	1314667

PLG	10^4 t	0	0	0	0	0
Refinery Gas	10^4 t	8.55	0	4.27	12.82	339888
Subtotal						2472306.601
Total						229226818

Sources: China Energy Statistical Yearbook 2007

The result from the above table:
λ_{Coal}=98.70%, λ_{Oil}=0.22%, λ_{Gas}=1.08%

Sub-Step 2b. Calculating the fuel-fired emission factor

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$$

Where:
$EF_{Thermal}$ is the fuel-fired emission factor;
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are corresponding to the emission factors of coal, oil and gas fired power plants which are applied by the most advanced commercialized technologies.

Table 10 Emission factors of Coal, Oil and Gas with the most advanced commercialized technologies applied by the fuel-fired power plants

	Parameters	Fuel consumption rate	Fuel Emission Factor（tc/TJ）	Oxidation	Emission Factor（tCO_2/MWh）
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired plant	$EF_{Coal,Adv}$	37.28%	25.8	1	0.9135
Oil-fired plant	$EF_{Oil,Adv}$	48.81%	21.1	1	0.5706
Gas-fired plant	$EF_{Gas,Adv}$	48.81%	15.3	1	0.4138

Sources: The Baseline Emission Factors of Chinese Power Grids in 2007, NRDC.

Then
$EF_{Thermal}$ =0.9074 tCO_2/MWh.

Sub-Step 2c. Calculating the Build Margin Emission Factor.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

Where:
$EF_{grid,BM,y}$ is the Build Margin emission factor with advanced commercialized technologies for year *y*;
CAP_{Total} is the new capacity additions;
$CAP_{Thermal}$ is the new fuel-fired capacity additions.

Table 11 Installed Capacities of the Northeast China Grid in 2006

Installed Capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Fuel-fired	MW	16721	7039	12456	36216
Hydro	MW	1401	3872	853	6126
Nuclear	MW	0	0	0	0
Wind & Others	MW	216	221	115	552
Total	MW	18338	11132	13424	42894

Sources：China Electric Power Yearbook 2007

Table 12 Installed Capacities of the Northeast China Grid in 2000

Installed Capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Fuel-fired	MW	13937.9	4924.7	10069.9	28932.5
Hydro	MW	1248.5	3536.7	814.8	5600
Nuclear	MW	0	0	0	0
Wind & Others	MW	17	0	0	17
Total	MW	13800.4	7903.3	9900.5	31604.2

Sources：China Electric Power Yearbook 2001

Table 13 Installed Capacities of the Northeast China Grid in 1999

Installed Capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Fuel-fired	MW	12425.7	4583.1	10128.1	27136.9
Hydro	MW	1240	3508.2	774.5	5522.7
Nuclear	MW	0	0	0	0
Wind & Others	MW	22.9	0	0	22.9
Total	MW	13688.6	8091.3	10902.6	32682.5

Sources：China Electric Power Yearbook 2000

Table 14 Change Installed Capacity from 1999-2006

	Year 1999	Year 2000	Year 2006	2000-2006 New Capacity	Percentage of New Capacity Additions
	A	B	C	D=C-B	
Fuel-fired (MW)	**27136.9**	28932.5	36216	7283.5	87.57%
Hydro (MW)	**5522.7**	5600	6126	526	6.32%
Nuclear (MW)	**0**	0	0	0	0

Wind(MW)	**22.9**	43.9	552	508.1	6.11%
Total	**32682.5**	34576.4	42894	8317.6	100%
Percentage of Year 2005	76.19%	80.61%	100%		

Then，the result is：

$EF_{grid,BM,y}$=0.9074×87.57%=0.7946 tCO_2/MWh

Step 3 – Calculation of the Baseline Emission Factor (EF_y)

$EF_{grid,CM,y}$=0.75×$EF_{grid,OM,y}$+0.25×$EF_{grid,BM,y}$=0.75×1.2561 +0.25×0.7946 =1.1408 tCO_2/MWh

Step 4 – Calculation of the Baseline Emission (BE_y)

BE_y=$EF_{grid,CM,y}$×$EG_{PJ,y}$=1.1408×110,458=126,010 tCO_2/year

Annex 4

MONITORING INFORMATION

No Supplement Information.