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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Heilongjiang Mudanjiang Xiaoguokui Wind Power Project
PDD version 02
Date of document: 02/06/2009

A.2. Description of the project activity:

Heilongjiang Mudanjiang Xiaoguokui Wind Power Project (hereafter referred to as the proposed project) is a new grid connected renewable energy project developed by Hailin Longyuan Wind Power Co., Ltd. The proposed project is to be located in Hailin City, Heilongjiang Province, China, and involves the installation of 24 sets of 850 kW wind turbines, for a total installed capacity of 20.4 MW. The purpose of the proposed project is to generate electricity using wind power resources in the project region and to sell into and replace the same amount of power generation in Northeast Power Grid (NEPG) which is dominated by the fossil fuel fired power plants. The baseline scenario and the scenario existing prior to the start of the implementation of the proposed project activity is that 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".

It is estimated that the electricity delivered to the grid by the project activity will be 46,360 MWh, and as a result, **52,882** tonnes of CO2 emission reductions will be generated annually.

The contributions of the proposed project to sustainable development goal are summarized as follows:

- Being located in a power grid dominated by fossil fuel fired power plants, development of the proposed project will not only reduce GHG emissions but also mitigate local environmental pollution caused by air emissions from fossil fuel fired power plants;
- New 14 jobs will be generated;
- The implementation of the proposed project will be helpful to meet the energy demand, therefore, contribute to local economic development.

A.3. Project participants:

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)
China (host)	Hailin Longyuan Wind Power Co., Ltd.	No
Switzerland	Essent Trading International S.A.	No

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.:

Heilongjiang Province

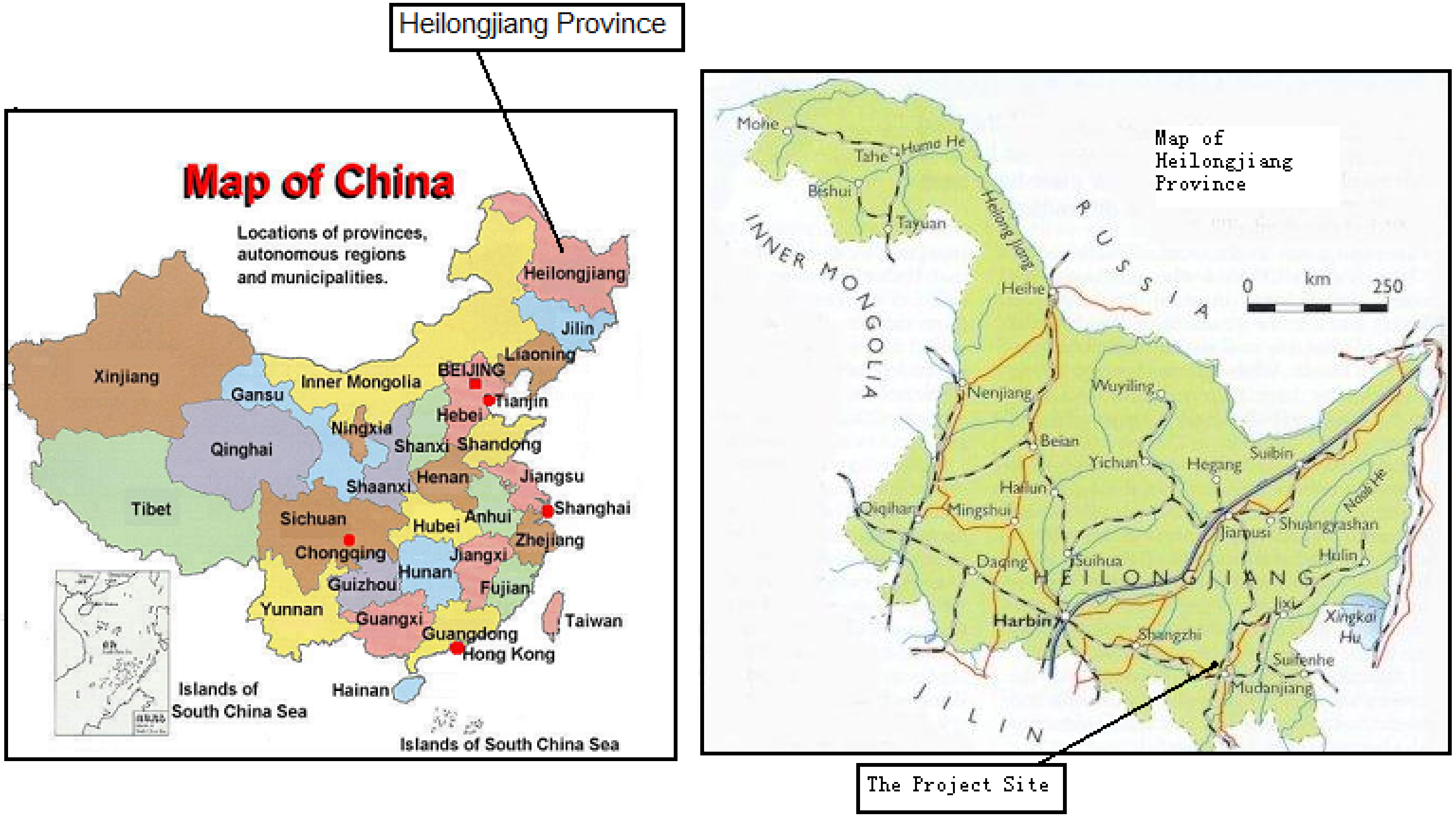
A.4.1.3. City/Town/Community etc:

Hailin City

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

The proposed project is located in Hailin City, Heilongjiang Province of China. The geographical coordinates of the proposed project are north latitude 45º16′54″ and east longitude 129º50′30″, its altitude is 1184.8 m above sea level. The wind farm of the proposed project is on the Guokui Mountain, at the northeast of Hailin City and 80 km away from the downtown of Mudanjiang City. The detailed location of the proposed project is shown in figure 1.

Figure 1: The detail location of Heilongjiang Mudanjiang Xiaoguokui Wind Power Project（in next page）


Heilongjiang Province
Map of China
Locations of provinces, autonomous regions and municipalities.
Heilongjiang
Jilin
Liaoning
Xinjiang
Gansu
Inner Mongolia
BEIJING
Tianjin
Hebei
Ningxia
Qinghai
Shanxi
Shandong
Tibet
Shaanxi
Henan
Jiangsu
Sichuan
Anhui
Shanghai
Hubei
Zhejiang
Chongqing
Jiangxi
Hunan
Guizhou
Fujian
Yunnan
Guangxi
Taiwan
Guangdong
Hong Kong
Islands of South China Sea
Hainan
Islands of South China Sea
Map of Heilongjiang Province
Mohe
Tahe
Huma He
Bishui
Tayuan
Heilong Jiang
RUSSIA
INNER MONGOLIA
Heihe
0 km 250
Nenjiang
Wuyiling
Beian
Yichun
Hegang
Suibin
Hailun
Qiqihar
Mingshui
Jiamusi
Shuangyashan
Daqing
Suihua
Hulin
HEILONGJIANG
Jixi
Harbin
Xingkai Hu
Shangzhi
Suifenhe
Mudanjiang
JILIN
The Project Site

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

The project activity falls under the following scope and category.
Sectoral scope: 1. Energy industries
Category: Grid-connected electricity generation from renewable energy sources

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

The proposed project is the installation of a new grid-connected zero-emission renewable power generation activity. The purpose of the proposed project is to generate electricity using wind power resources in the project region and to sell into Northeast Power Grid (NEPG) and replace the same amount of power generation (46,360 MWh each year) in it. Prior to the implementation of the project activity, there were 36,216 MW of thermal power plants, 6,126 MW of hydropower plants, 530 MW of wind power plants and 22 MW of other power plants in operation in Northeast Power Grid (NEPG)[1]. The amount of electricity delivered to the grid by the project activity would have otherwise been generated by the operation of these grid-connected power plants and by the addition of new generation sources.

The proposed project activity is to install and operate 24 sets of Vestas 52-850 kW wind turbines, each of which has the capacity of 850 kW. The total installed capacity is 20.4MW. The wind turbines are made in an enterprise located in Tianjin and owned solely by Denmark VESTAS Company. One of the features of Vestas 52-850 kW wind turbine is OptiTip, its pitch regulation system. This system features microprocessors which control the pitching of the blades, thus ensuring continuous adjustment to maintain optimal blade angles in relation to prevailing wind. Another feature is the OptiSpeed generator, a technology that allows the rotor speed to vary by as much as 30 per cent above and below synchronous speed, thereby maximizes the aerodynamic efficiency of the rotor in response to changing wind conditions.

The average annual operation hour of the proposed project is 2272.5h, and the PLF is 0.2594.

The main technical specifications of the Vestas 52-850KW wind turbine are as follows[2]:

	Unit	Amount
Rated Capacity	kW	850
Rotor diameter	m	52
Blade number		3
Area swept	m^2	2,124
Cut-in wind speed	m/s	4
Cut-out wind speed	m/s	25
Power regulation		Pitch/OptiSpeed
Generator type		Synchronous with OptiSpeed
Generator voltage	V	690
Estimated Technical Lifetime	Year	20

[1] China Electric Power Yearbook 2007

[2] www.vestas.com

A new 35/110kV switch station will be constructed within the proposed project. Each turbine will have a 690V to 35kV transformer, from which a 35kV line will link into on-site 110kV transformer at the switch station, through the 110kV transformer the electricity output will be transmitted to Lianhua 110kV substation of the grid, and then to Heilongjiang Provincial Power Grid which is an integral part of Northeast Power Grid. The metering equipments both at the outlet of the switch station and the entrance to Lianhua 110kV substation are arranged for monitoring the electricity delivered to the grid, and by them the electricity delivered to the grid will be monitored continuously as the applied methodology required.

The auxiliary electric system of the proposed project includes on-site control, protection, measure, signalling and surveillance in central control room at the site. The targets to be controlled and monitored include 24 wind turbines and transformers. The wind farm will be dispatched by regional dispatch centre and wind turbines could be measured and signalled remotely by Internet.

No technology from abroad is transferred for the CDM project activity.

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

The proposed project adopts renewable crediting periods (7 years × 3). The total estimation of emission reductions in the first crediting period (01/11/2009-31/10/2016) is **370,174 tCO2e**, as shown in the following table.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
01/11/2009-31/10/2010	52,882
01/11/2010-31/10/2011	52,882
01/11/2011-31/10/2012	52,882
01/11/2012-31/10/2013	52,882
01/11/2013-31/10/2014	52,882
01/11/2014-31/10/2015	52,882
01/11/2015-31/10/2016	52,882
Total estimated reductions (tonnes of CO_2e)	370,174
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	52,882

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology:

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

Approved consolidated baseline and monitoring methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”- ACM 0002 Version 09

The methodology also refers to the latest approved versions of the following tools:

◆Tool to calculate the emission factor for an electricity system (version 01.1);
◆Tool for the demonstration and assessment of additionality (version 05.2);

For more information regarding the methodology and the tools as well as their consideration by the Executive Board please refer to http://cdm.unfccc.int/goto/MPappmeth.

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

The proposed project can meet the applicability criteria of the baseline methodology (ACM0002 version09); therefore, the methodology is applicable to the proposed project.

- The proposed project is the installation of a new grid-connected zero-emission renewable power generation activity from wind source;
- The proposed project is not an activity that involves switching from fossil fuels to renewable energy sources at the site of the project activity;
- The geographic and system boundaries for the relevant electricity grid (Northeast Power Grid) can be clearly identified and information on the characteristics of the grid is available.

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

The spatial extent of the project boundary includes Heilongjiang Mudanjiang Xiaoguokui Wind Power Project and all power plants connected physically to the Northeast Power Grid that the CDM project power plant is connected to. Northeast Power Grid is defined as the project electricity system, which consists of independent province-level electricity systems including Liaoning, Jilin and Heilongjiang province that can be dispatched without significant transmission constraints. The connected electricity system is North China Power Grid, which is connected by transmission lines to the project electricity system. Northeast Power Grid has the net electricity export to North China Power Grid. The flow diagram of the project boundary is as in figure 2.

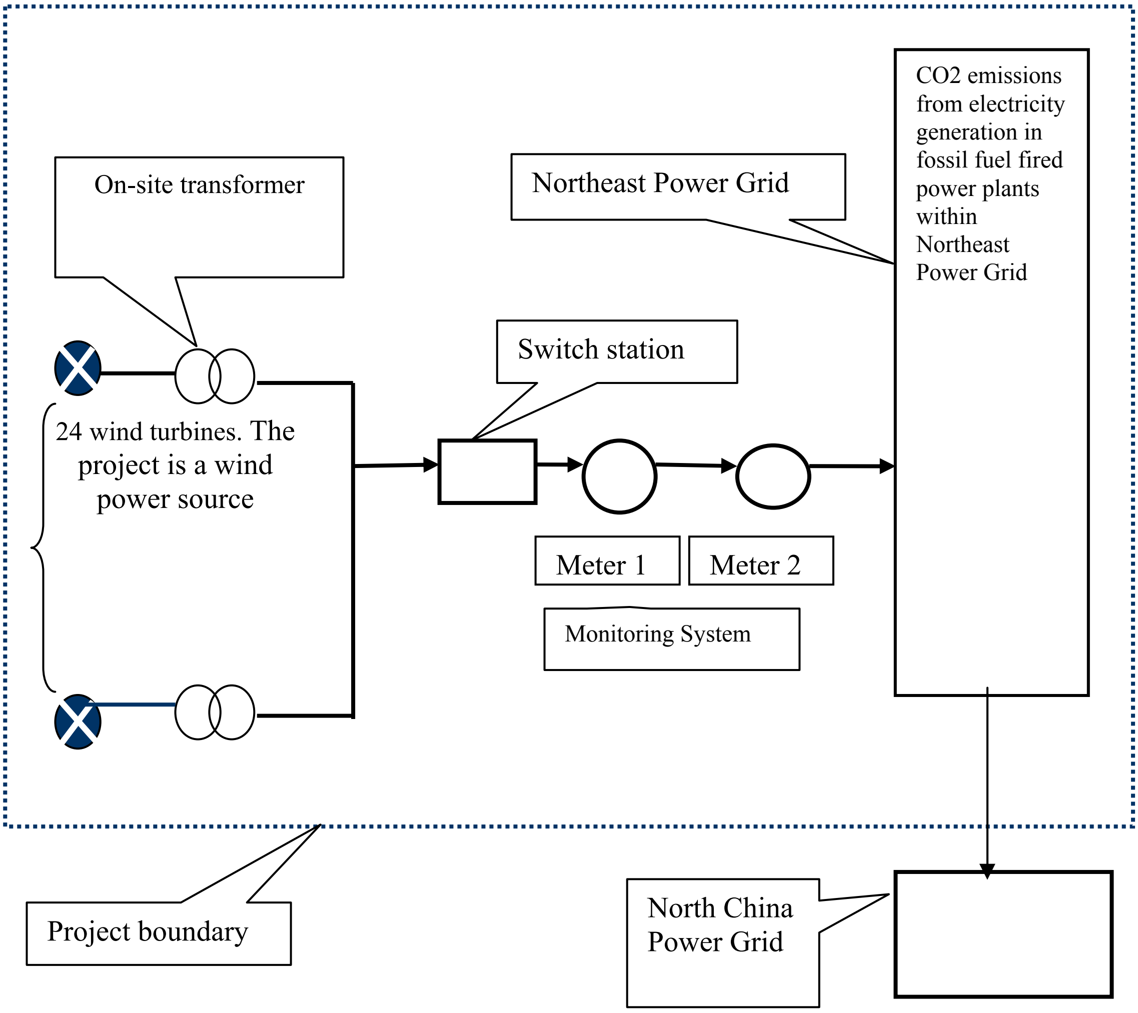


Figure 2: The diagram of the project activity boundary

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the following table:

	Source	Gas	Included?	Justification / Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO2	Yes	Main emission sources
		CH4	No	Minor emission source
		N2O	No	Minor emission source

Project Activity	The project is a wind power source	CO2	No	According to ACM0002, the project emission of wind power project activity is not considered.
		CH4	No	According to ACM0002, the project emission of wind power project activity is not considered.
		N2O	No	According to ACM0002, the project emission of wind power project activity is not considered.

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

The proposed project is the installation of a new grid-connected wind power generation activity. The purpose of the proposed project is to generate electricity using wind power resources in the project region and to sell into Northeast Power Grid (NEPG) and replace the same amount of power generation (46,360 MWh each year) in it. Prior to the implementation of the project activity, there were 36,216 MW of thermal power plants, 6,126 MW of hydropower plants, 530 MW of wind power plants and 22 MW of other power plants in operation in Northeast Power Grid (NEPG)[3]. The amount of electricity delivered to the grid by the project activity would have otherwise been generated by the operation of these grid-connected power plants and by the addition of new generation sources.

Thus the baseline scenario is the following as per ACM0002:

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".

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):

The implementation timeline of the proposed project activity:

No.	Date	Description
1	09/2007	EIA finished.
2	10/2007	FSR finished. The CDM incentive was seriously considered in the FSR of the proposed project[4].
3	15/11/2007	Shareholder meeting was held, a resolution was reached that the project was planned to be developed as a CDM project.
4	28/12/2007	EIA approval by Heilongjiang Environmental Protection Bureau.
5	25/12/2007	Equipment Purchasing Contract signed.
6	05/03/2008	The date when the CDM development Consultant Contract signed.

[3] China Electric Power Yearbook 2007

[4] Feasibility Study Report of the proposed project

7	24/05/2008	Construction service contract was signed
8	10/06/2008	The date when construction works started.
9	22/09/2008	Validation contract was signed
10	13/10/2008	ERPA signing date
11	15/10/2008	The PDD was made publicly available directly on the UNFCCC CDM website.

FSR was finished in October 2007, due to the lower project IRR of less than the benchmark of 8%, it is recommended that the additional revenue would be necessary to overcome the financial barriers and advice PP to apply for the support from CDM. On 15 November 2007, a decision of CDM application was made at the shareholder meeting. On 25 December 2007, the Equipment Purchasing Contract was signed for the proposed project, which could be regarded as the starting date of the implementation of the project. The project owner signed the CDM development consultation contract with the CDM Consultation Company on 5 March 2008. On 10 June 2008, the construction works started. On 22 September 2008, the project owner signed the validation contract with Bureau Veritas Certification Holding S.A.S. The PDD was made publicly available on the UNFCCC CDM website on 15 October 2008.

The following steps are used to demonstrate the additionality of the proposed project according to "Tools for the demonstration and assessment of additionality (version 05.2)" agreed by Executive Board and requested by ACM0002 (version 09).

Step 1. Identification of alternatives to the project activity consistent with mandatory laws and Regulations

Realistic and credible alternatives to the project activity are defined through the following sub-steps:

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

The alternatives that provide outputs or services comparable with the proposed CDM project activity are to include:

a) The proposed project activity undertaken without being registered as a CDM project activity;
b) The thermal power plant with the same annual electricity output as the proposed project.
c) Other renewable energy project with the same annual electricity output as the proposed project.
d) To provide the same electricity output by Northeast Power Grid.

For the alternative c), besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in China. Due to the technology development status and the high cost for power generation, geothermal, solar PV and biomass power with the same annual electricity output as the proposed project are alternatives far from being attractive investment in the grid in China[5] [6] [7]. Only hydropower projects have the investment return

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[5] http://news.163.com/07/0919/08/3OO8EQIR000120GU.html

[6] The development report for solar PV in china (http://www.shec.gov.cn/xxpt/work/xw1.jsp?id=1654&type=1)

[7] The industrial analysis for biomass technology in china by Economy Reference Newspaper(http://jjckb.xinhuanet.com/cjxw/2007-11/27/content_75467.htm)

rate that can compete over that of wind power projects in China. But Hailin City, where the proposed project is located in, is in the mountain area, there is no exploitable hydro power resource in the area[8]. Furthermore, the hydro resources that can be utilized in Heilongjiang Province are not able to provide a comparable output or the same services as the proposed project given the fact that the installed hydropower capacities in Heilongjiang province are 834.6 MW in 2003, 844.6 MW in 2004, 846.7 MW in 2005 and 853 MW in 2006 respectively[9], the installed hydro power capacity addition is less than 20 MW from the year 2003 to 2006. Therefore, though the alternative c) is in compliance with all mandatory laws and regulations, is not a realistic alternative.

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

The mandatory laws and regulations for the proposed project include laws, central government regulations, local regulations, departmental rules and disciplines related to electricity and environment protection.

The alternative b) should be eliminated from the following consideration because it does not comply with the national regulation for controlling small scale thermal power plant. The average generation hours for fossil fuel fired power plants are 5404hours[10] in Heilongjiang Province in 2006 while the effective generation hours for proposed project are 2,272.4hours[11], to provide the same output as the proposed project, the alternative baseline scenario for the proposed project should be a grid-connected fossil fuel fired power plant with installed capacity of about 8.58 MW. However, according to Chinese regulations, thermal power plants of less than 135 MW are prohibited for construction within the grid connected area[12]. Therefore, alternative b) conflicts with Chinese regulations. In this sense, alternative b) cannot be a realistic alternative.

The other alternatives described in sub-step 1a are all in compliance with mandatory laws and regulations as required by the methodology used.

To summarize, the potential realistic and creditable alternatives that can provide the same output or services as the proposed project are a) and d). The investment analysis in Step 2 will show the proposed project undertaken without being registered as a CDM project activity (alternative a) is financially unattractive.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

Three options can be applied for the investment analysis: the simple cost analysis, the investment comparison analysis and the benchmark analysis.

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8 Feasibility Study Report of the proposed project P1-1,2

9 China Electric Power Yearbook 2004-2007

10 China Electric Power Yearbook 2007

11 FSR of the proposed project

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

The simple cost analysis is not applicable for the proposed project because the project activity will produce economic benefit (from electricity sale) other than CDM related income.

Out of the remaining options, project participants selected Option III: Benchmark analysis.

Sub-step 2b. Apply benchmark analysis

The benchmark for project Internal Return Rate on total investment of Chinese power industry is 8%[13], which has been used widely for Feasibility Studies of the power project investments.

Based on the above-mentioned benchmark, the calculation and comparative analysis of financial indicators for the proposed project are carried out in sub-step 2c.

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

(1) Basic parameters for calculation of financial indicators

Based on the Feasibility Study Report designed by the independent and qualified design institute and approved by Heilongjiang DRC, the basic parameters for calculation of financial indicators are as follows:

Item	Unit	Amount	Note
Capacity	MW	20.4	FSR, P14-1
Static total investment	Million RMB	198.25	FSR, P14-1
Annual output	MWh/year	46,360	FSR, P14-1
Tariff (excluding VAT)	RMB/kWh	0.5622	FSR, P14-3
Depreciable life of fixed assets	year	12	FSR, P14-2
Rate of residual value of assets	%	4	FSR, P14-2
Value Added Tax (VAT)	%	8.5	FSR, P14-3
Income Tax	%	25	FSR, P14-3
Project lifetime	Year	20	FSR, P14-1
Annual O&M cost	Million RMB	5.67	FSR, P14-17
CERs price	EUR/tCO_2	12.6	ERPA

(2) Comparison of IRR for the proposed project and the financial benchmark

The Project financial indicators (IRR) with and without income from selling CERs are listed in the following table. Without income from selling CERs, Project IRR of the proposed project is lower than the benchmark IRR and the proposed project is financially unattractive because of its low profitability. While considering such income, the financial attraction will be changed, the IRR of the proposed project is better than the benchmark and the proposed project is financially attractive.

Items	Without income from CERs	Benchmark	With income from CERs

[13] Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects

Project IRR	6.52%	8%	9.92%

Sub-step 2d. Sensitivity analysis

The objective of this sub step is to show the conclusion regarding the financial attractiveness is robust to reasonable variations of the critical assumptions.

Four factors are considered in following sensitivity analysis:

1) Static total investment.
2) Annual O & M costs
3) Annual generation output
4) Tariff (excluding VAT)

Assuming the above factors fluctuate within the range from -10%-+10%, the IRR of the proposed project (without income from selling CERs) varies to a different extent, as shown in below.

The impact of the static total investment on IRR

Variation (%)	-10.40	-10	-7.5	-5	-2.5	0	+2.5	+5	+7.5	+10
IRR (%)	8.00	7.94	7.56	7.20	6.85	6.52	6.20	5.89	5.59	5.30

The impact of the annual O & M costs on IRR

Variation (%)	-49.3	-10	-7.5	-5	-2.5	0	+2.5	+5	+7.5	+10
IRR (%)	8.00	6.83	6.75	6.67	6.59	6.52	6.44	6.36	6.28	6.21

The impact of annual generation output on IRR

Variation (%)	+10.70	-10	-7.5	-5	-2.5	0	+2.5	+5	+7.5	+10
IRR (%)	8.00	5.06	5.43	5.80	6.16	6.52	6.87	7.22	7.56	7.90

The impact of tariff on IRR

Variation (%)	+10.70	-10	-7.5	-5	-2.5	0	+2.5	+5	+7.5	+10
IRR (%)	8.00	5.06	5.43	5.80	6.16	6.52	6.87	7.22	7.56	7.90

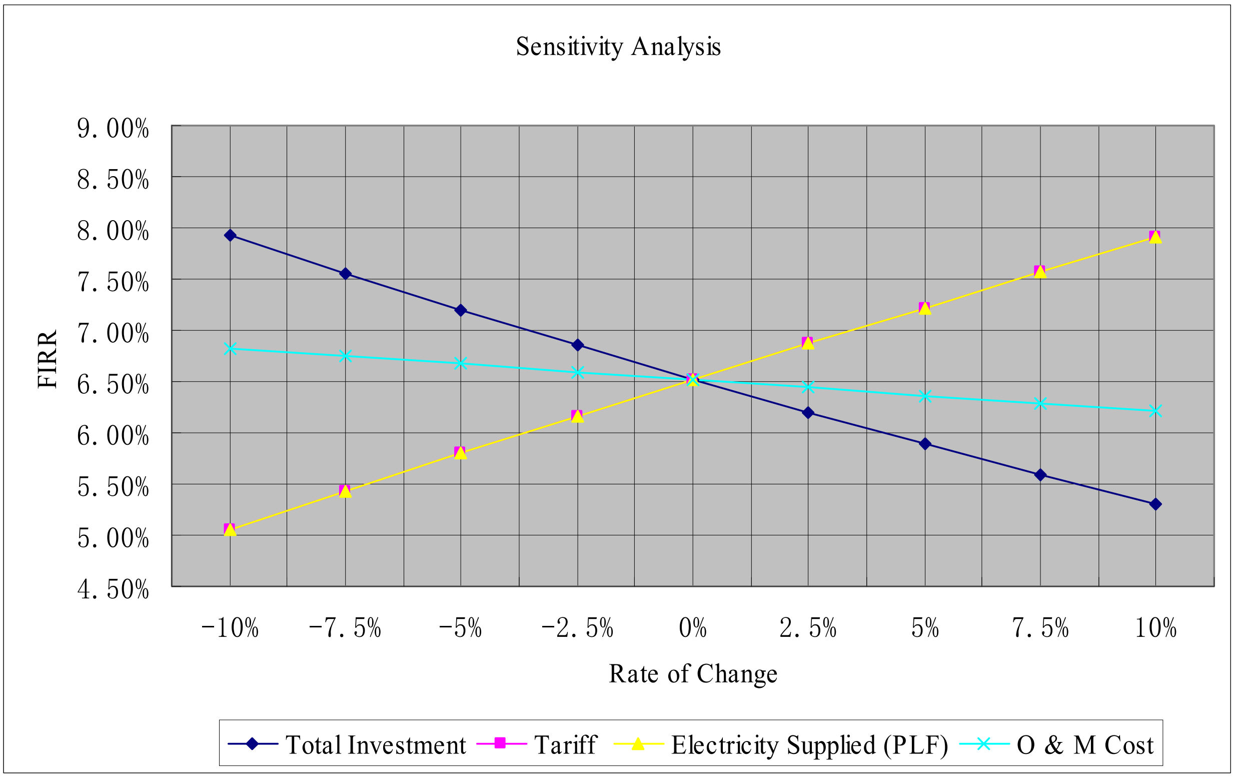

Figure3: Sensitivity Analysis of the Proposed Project

Above tables and figure show that the IRR of the proposed project keeps lower than the benchmark when the key factors fluctuate within the range from -10%～+10%.

In the case that the static total investment decreases by 10.40%, the IRR of the proposed project could reach the 8% benchmark. For the proposed project, the majority of the static total investment is used to purchase the wind turbines and towers, whose expenditure have been fixed under the equipment purchasing agreement[14]. The rest of the static investment, due to the increasing trend of construction material costs[15], is also unrealistic to be lowered down. Therefore, it is very unlikely for the static investment have a reduction of 10.40% on the value from the FSR.

When the annual O & M cost increases by about 49.3%, the IRR of the project would exceed the benchmark. On the one hand, the basic annual O & M costs assumption is from the FSR, which was approved by Heilongjiang Development & Reform Commission (HDRC); on the other hand, along with a rapid economic development, China has been experiencing rising raw material and labour costs[16]. As a result, a significant 49.3% decrease in annual O & M costs is not realistic and obviously the project IRR is not likely to reach the 8% benchmark.
The sensitivity around annual generation output is similar to the sensitivity around the tariff (both impact

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[14] Equipment Purchasing Agreement of the project

[15] http://www.china.com.cn/chinese/EC-c/1246238.htm

[16] http://www.china.com.cn/chinese/EC-c/1246238.htm
http://www.chinadaily.com.cn/hqcj/2007-09/03/content_6075777.htm

the turnover the same way). According to the feasibility study report of the proposed project, the annual output is estimated basing on the long term (from 1984 to 2006) weather statistic data provided by local meteorological station and 1-year wind resources measurement, which at first using professional software WAsP to select the rich wind source area, then using software Wind Farmer to optimize the location of each turbine for maximizing power generation. The estimated annual output in FSR is a credible value, for it has been taken the average wind data over past 22 years into account. Therefore, the annual output in FSR is an average value. It is unreasonable to have an increase of 10.70% on this average value throughout the lifetime of the Project.

In the case that the tariff increases by 10.70%, the Project IRR of the proposed project begins to exceed the benchmark. On 23 July 2008, the guided tariff for the proposed project was issued by the National Development and Reform Commission after start of the proposed project[17]. In China, the guided tariff is commonly implemented by the project owner and the grid company. Therefore, it is impossible that the tariff would increase by 10.70% higher than the tariff in the FSR.

To conclude, under the reasonable variations in the critical assumptions, the conclusion regarding the financial additionality is robust and supported by sensitivity analysis.

Step 3. Barrier analysis

Not applicable.

Step 4. Common practice analysis

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

According to the definitions of other activities similar to the proposed project in "Tool for the Demonstration and Assessment of Additionality (version 05.2)", the similar projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

In China, most of wind power projects are regulated by the provincial government. Investment climate, tariff, land policy, regulations etc. are usually similar for wind power projects in the same province. The location of the proposed project belongs to Heilongjiang province. Heilongjiang province is selected as the geographical scope for the common practice analysis of the project.

The activities should be implemented after 2002. The wider power sector reforms happened in China after 2002 leaded to diversification in the ownership of generation capacity.[18] As a result, new generation, including wind power, was expected to compete under more commercial conditions.

The following table lists the wind farm projects in Heilongjiang province since the year of 2002. The registered CDM projects are not included under the guidance of the last version of additionality demonstration tool.

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

[18] http://www.chinanews.com.cn/2002-12-30/26/258825.html

project	Installed capacity(MW)	Status	Is it applying for CDM?
Huafu Mulan Wind Farm project	12	Operational (2003.12)	No. Demonstration Project
Huafu Fujin Wind Farm	24.3	Operational (2004.9)	No. Demonstration Project

Data source: Shi Pengfei (Deputy Director, Chinese Wind Energy Association), Statistics on China Wind Farm Cumulative Installed Capacity in 2005, 2006 and 2007[19]

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

Two identified projects listed above are demonstration projects, which were funded by international low interest loan[20] [21]. The proposed project does not enjoy these favourable policies, and takes place in a different environment with respect to regulatory framework, investment climate, access to financing.
To conclude, there are essential distinctions between the proposed project and existing similar projects. The existence of the project mentioned above does not contradict the claim that the proposed project activity is financially unattractive.
In conclusion, the proposed project activity meets all criteria of "Tool for the demonstration and assessment of additionality". The proposed project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The proposed project is the installation of a new grid-connected renewable power plant, and 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".

Baseline emissions

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

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

Where:

[19] Statistics on China Wind Farm Cumulative Installed Capacity in 2005, 2006 and 2007 (The evidences are available for DOE validation)

[20] http://www.sxcoal.com/news/2008/11/29/227059/Article.html

[21] http://www.chinapower.com.cn/newsarticle/1005/new1005504.asp

BE_y = Baseline emissions in year *y* (tCO_2/yr).

EG_y = Electricity supplied by the project activity to the grid (MWh).

$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (version 01.1).

The methodological tool "Tool to calculate the emission factor for an electricity system" (version 01.1) determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the "operating margin" (OM) and "build margin" (BM) as well as the "combined margin" (CM). The operating margin refers to a cohort of power plants that reflect the existing power plants whose electricity generation would be affected by the proposed CDM project activity. The build margin refers to a cohort of power units that reflect the type of power units whose construction would be affected by the proposed CDM project activity.

The methodological tool "Tool to calculate the emission factor for an electricity system" (version 01.1) provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$EF_{grid,CM,y}$	tCO_2/MWh	Combined margin CO_2 emission factor for grid connected power generation in year y
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for grid connected power generation in year y
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for grid connected power generation in year y

The following six steps are applied to calculate the emission factor for an electricity system:

STEP 1: Identify the relevant electric power system.
STEP 2: Select an operating margin (OM) method.
STEP 3: Calculate the operating margin emission factor according to the selected method.
STEP 4: Identify the cohort of power units to be included in the build margin (BM).
STEP 5: Calculate the build margin emission factor.
STEP 6: Calculate the combined margin (CM) emissions factor.

Step1: Identify the relevant electric power system.

Using the boundary definitions of the Chinese DNA, the spatial extent of the project boundary includes Heilongjiang Mudanjiang Xiaoguokui Wind Power Project and all power plants connected physically to the Northeast Power Grid that the CDM project power plant is connected to. Northeast Power Grid is defined as the **project electricity system**, which consists of independent province-level electricity systems including Liaoning, Jilin and Heilongjiang province that can be dispatched without significant transmission constraints. The **connected electricity system** is North China Power Grid, which is connected by transmission lines to the project electricity system.

Since the Northeast Power Grid has the electricity exports to the North China Power Grid, the spatial

extent is limited to the project electricity system (Northeast Power Grid).

Step2: Select an operating margin (OM) method

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

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

The simple OM method (option a) can only be used if low-cost/must-run resources [22] constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- ◆Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or
- ◆Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year *y* is usually only available later than six months after the end of year *y*, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year *y*, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the dispatch data analysis OM, use the year in which the project activity displaces grid electricity and update the emission factor annually during monitoring.

The data vintage chosen is documented in the CDM-PDD and not changed during the first crediting period.

Power plants registered as CDM project activities should be included in the sample group that is used to calculate the operating margin if the criteria for including the power source in the sample group apply.

The justifications of the choice of method to calculate OM emission factor are as follows.

Method (c): The dispatch data analysis OM emission factor is determined based on the power units that are actually dispatched at the margin during each hour *h* where the project is displacing electricity. This method requires the dispatch order of each power plant and the dispatched electricity generation of all the power plants in the power grid during each hour. Since the dispatch data, power plants operation data are

[22] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

considered as confidential materials and only for internal usage and are not available publicly. Thus, method (c) is not applicable for the proposed project.

Method (b): Method (b) requires the annual load duration curve of the power grid and the load data of every hour data during the whole year on the basis of the time order. As mentioned above, the dispatch data and detailed load curve data are not available publicly. Therefore, method (b) is not applicable for the proposed project as well.

In terms of Method (d) and Method (a): The average OM emission factor (option d) is calculated as the average emission rate of all power plants serving the grid, using the methodological guidance as described under (a) above for the simple OM, but including in all equations also low-cost/must-run power plants. The simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants. Considering the low-cost/ must run resources only constitute 5.44%, 4.76%, 6.45%, 8.28% and 5.25% of total generation of Northeast Power Grid from the year 2002 to 2006, respectively (China Electric Power Yearbooks 2003-2007), as shown in table below. Therefore, method (a) is chosen to calculate OM emission factor for the proposed project.

Share of the Low-cost/must run resources in the Northeast Power Grid

Year	Low-cost/must run resources(GWh)	All power resources(GWh)	Share of the Low-cost/must run resources
	A	B	C=A/B
2002	8,137	149,682	5.44%
2003	7,897	165,822	4.76%
2004	11,823	183,090	6.45%
2005	15,972	192,963	8.28%
2006	12,483	237,802	5.25%

(Data source: China Electric Power Yearbooks 2003-2007)

In conclusion, the Ex ante option of the data vintages is chosen to calculate the emission factor of the Northeast Power Grid by using the simple OM method (option a) for the proposed project.

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 (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

◆ Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or

◆ Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or

◆ 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 (option C)

Option A should be preferred and must be used if fuel consumption data is available for each power plant / unit. In other cases, option B or option C can be used. For the purpose of calculating the simple OM, Option C should only be used if the necessary data for option A and option B is not available and can only be used if only nuclear and renewable power generation are considered as low-cost / must-run power sources and if the quantity of electricity supplied to the grid by these sources is known.

For the proposed project, the data on fuel consumption, net electricity generation and the average efficiency of each power unit are unavailable, thus option A and option B cannot be used. Nevertheless, the 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 are available, and, nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known, therefore, Option C can be used.

On 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (2)$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO2 emission factor in year y (tCO2/MWh)

$FC_{i,y}$ = 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 (GJ / mass or volume unit)

$EF_{CO2,i,y}$ = CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)

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

i = All fossil fuel types combusted in power sources in the 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)

For this approach (simple OM) to calculate the operating margin, 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 including electricity imports to the grid[23]. Electricity imports should be treated as one power plant source.

Regarding parameter selection, local values of $NCV_{i,y}$ and $EF_{CO2,i,y}$ should be used where available. If no such values are available, IPCC world-wide default values are preferable. The Net Calorific Value ($NCV_{i,y}$) of each type of fossil fuel used in the calculation comes from China Energy Statistic Yearbook 2007. Emission factors ($EF_{CO2,i,y}$) of each type of fossil fuel come from IPCC 2006 default values.

As chosen in step 2, the simple OM emission factor is calculated by using Ex-ante option of data vintages, i.e. a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

The data of installed capacity, electricity generation and fuel consumptions are all from China Energy Statistical Yearbooks 2005-2007 and China Electric Power Yearbooks 2005-2007.

Given the above, the simple operating margin CO2 emission factor ($EF_{grid,OMsimple,y}$) of Northeast Power Grid is **1.256099 tCO2/MWh.** The detailed calculations and data are listed in the annex 3 (The baseline emission factor OM is same as that provided by Chinese DNA, the website is http://cdm.ccchina.gov.cn/web/index.asp).

Step 4: Identify the cohort of power units to be included in the build margin

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[24].

The set of power units that comprises the larger annual generation should be used.

A power unit is considered to have been built at the date when it started to supply electricity to the grid.

Power plant registered as CDM project activities should be excluded from the sample group *m*. However, if group of power units, not registered as CDM project activity, identified for estimating the build margin emission factor includes power unit(s) that is (are) built more than 10 years ago then:

(i) Exclude power unit(s) that is (are) built more than 10 years ago from the group; and

(ii) Include grid connected power projects registered as CDM project activities, which are dispatched by dispatching authority to the electricity system.

[23] An import from a connected electricity system should be considered as one power source.

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

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

In terms of vintage of data, one of the following two options can 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 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. 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 activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For the proposed project, option 1 is chosen to calculate Build Margin emission factor.

Step 5: Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (3)$$

Where:

$EF_{grid,BM,y}$ =Build margin CO2 emission factor in year y (tCO2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year y (MWh)

$EF_{EL,m,y}$ = CO2 emission factor of power unit *m* in year y (tCO2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

No matter which options for calculating BM factor mentioned in step 4 was adopted for the proposed project; the same issue on data availability must be addressed. Currently, it is very difficulty to get the capacity margin data of power plants in China, since these data as well as net quantity of electricity generated and delivered to the grid and fuel consumption data in power unit *m* are regarded as commercial secrets or only for internal usage. According to the guidance from the CDM Executive Board for a deviation of the baseline methodology of AM0005, which had combined into the baseline methodology of ACM0002, the following deviation was adopted to calculate the Build Margin emission factor
(http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ):

1）Use of capacity additions for estimating the build margin emission factor for grid electricity.
2）Use of weights estimated using installed capacity in place of annual electricity generation.
3）Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

Then the following steps were adopted to calculate the Build Margin emission factor:

1. The breakdown data by power plants are not while the aggregate data by different types of fuels are available. Considering this situation, the *m* sample group will consist of capacity addition by power sources with same fuel instead of by power plants. For the proposed project the *m* sample group will consist of fossil fuel fired capacity addition, hydropower capacity addition and other capacity addition;
2. Assuming that all the power plants with same fuel type have equal annual operation hours, and identify the starting year t_0 which the power capacity additions from t_0 to t (i.e. the recent year of which the latest data is available) in the electricity system that comprise 20% of the system generation (in MWh).

   The capacity addition belonging to *m* sample group thus could be identified. For the proposed project, the most recent year of which data is available is 2006, while t_0=2000, the total capacity addition during 2000 to 2006 consisting of 7283.5MW of fossil fuel fired capacity, 526 MW of hydropower capacity and 0MW of nuclear power capacity, and 508.1MW of other capacity[25], the total capacity addition during 2000 to 2006 comprises 20% of the system generation in 2006.

3. To be conservative, zero emission factors were selected for hydropower capacity and other capacity. Moreover, since specific data on coal fired capacity, oil fired capacity, and gas fired capacity could not be separated from current statistical data on fossil fuel fired capacity, the following approach was adopted for calculating the emission factor of fossil fuel fired capacity addition:

(1) With the energy balance sheet in China Energy Statistical Yearbook for the most recent year, calculating the respective percentages of CO2 emissions from coal fired power generation, oil fired power generation, and gas fired power generation against total CO2 emissions from fossil fuel fired power generation:

[25] China Electric Power Yearbook 2004-2006

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL, j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (4)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL, j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (5)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS, j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (6)$$

Where:

$FC_{i,j,y}$ = The amount of fuel i (in a mass or volume unit) consumed by province j in year y ;
$NCV_{i,y}$ =Net calorific value (energy content) of fossil fuel type i in year y (GJ/ mass or volume unit）;
$EF_{CO_2,i,j,y}$ = CO2 emission factor of fossil fuel type i in year y (tCO2/GJ).

$COAL, OIL, and\ GAS$ = The aggregation of various kinds of coal, oil, and gas as fossil fuels.

(2) Calculating the corresponding emission factor for fossil fuel fired power generation:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (7)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are the emission factors for the best commercially available technology of coal fired power generation, oil fired power generation, and gas fired power generation, respectively (See Annex 3 for detailed calculation).

4. Using the share of different type of capacity in total capacity addition as weight, the weighted average of emission factors of different type capacity is calculated as the Build Margin emission factor $EF_{grid,BM,y}$ of Northeast Power Grid (See Annex 3 for detailed calculation):

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (8)$$

Where:

CAP_{Total} = The total capacity addition
$CAP_{Thermal}$ =The fossil fuel fired capacity addition

Following the four steps above, the build margin emission factor $EF_{grid,BM,y}$ of the Northeast Power Grid is calculated to be **0.7946tCO2/MWh.** The detailed calculations and data are listed in the annex 3 (The build margin emission factor BM is same as that provided by Chinese DNA, the website is http://cdm.ccchina.gov.cn/web/index.asp).

Step 6: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (9)$$

Where:
$EF_{grid,BM,y}$ =Build margin CO2 emission factor in year y (tCO2/MWh)
$EF_{grid,OM,y}$ =Operating margin CO2 emission factor in year y (tCO2/MWh)
w_{OM} =Weighting of operating margin emissions factor (%)
w_{BM} =Weighting of build margin emissions factor (%)

Wind project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.

The default weights are adopted for the proposed project, the baseline emission factor is:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} = \mathbf{1.1407\ tCO2/MWh}$$

Project emissions

For wind power project activities, $PE_y = 0$

Leakage

For wind power project activities, $LE_y = 0$

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (10)$$

Where:

ER_y = Emission reductions in year y (t CO2e/yr).
BE_y = Baseline emissions in year y (t CO2e/yr).

PE_y = Project emissions in year y (t CO2/yr).

LE_y = Leakage emissions in year y (t CO2/yr).

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

Data / Parameter:	$FC_{i,y}$, $FC_{i,j,y}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i (in a mass or volume unit) consumed by power plant/unit (or in the project electricity system in case of $FC_{i,y}$) in year y , or the amount of fuel type i (in a mass or volume unit) consumed by province j in year y .
Source of data used:	China Energy Statistical Yearbook 2005-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Simple OM: For each crediting period using the most recent three historical years (i.e. 2004-2006) for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option). BM: For the first crediting period, following the EB guidance. For the second and third crediting period, only once ex-ante at the start of the second crediting period.
Any comment:	

Data / Parameter:	$EG_{m,y}$, EG_y
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant / unit *m* (or in the project electricity system in case of EG_y) in year y
Source of data used:	China Electric Power Yearbook 2005-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Simple OM: For each crediting period using the most recent three historical years (i.e. 2004-2006) for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) BM: For the first crediting period, following the EB guidance. For the second and third crediting period, only once ex-ante at the start of the second crediting period.
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/ mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Source of data used:	China Energy Statistical Yearbook 2007
Value applied:	See Annex 3
Justification of the choice of data or description of	Simple OM: For each crediting period using the most recent three historical

measurement methods and procedures actually applied :	years (i.e. 2004-2006) for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) BM: For the first crediting period, following the EB guidance. For the second and third crediting period, only once ex-ante at the start of the second crediting period.
Any comment:	

Data / Parameter:	$EF_{CO_2,i,y}$
Data unit:	tCO2/GJ
Description:	CO2 emission factor of fossil fuel type i in year y
Source of data used:	2006 IPCC default values
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	2006 IPCC values have been used for fuel types since no country specific CO2 emission factors are available Simple OM: For each crediting period using the most recent three historical years (i.e. 2004-2006) for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) BM: For the first crediting period, following the EB guidance. For the second and third crediting period, only once ex-ante at the start of the second crediting period.
Any comment:	

Data / Parameter:	CAP_y
Data unit:	MW
Description:	The installed capacity in the project electricity system in year y
Source of data used:	China Electric Power Yearbook 2005-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use of capacity additions for estimating the build margin emission factor for grid electricity under the guidance of EB.
Any comment:	

Data / Parameter:	$\eta_{coal,adv}$
Data unit:	%
Description:	Best electricity supply efficiency for coal fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081231101111351.pdf
Value applied:	37.28
Justification of the choice of data or description of measurement methods and	Country specific value

procedures actually applied :	
Any comment:	

Data / Parameter:	$\eta_{oil,adv}$
Data unit:	%
Description:	Best electricity supply efficiency for oil fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081231101111351.pdf
Value applied:	48.81
Justification of the choice of data or description of measurement methods and procedures actually applied :	Country specific value
Any comment:	

Data / Parameter:	$\eta_{gas,adv}$
Data unit:	%
Description:	Best electricity supply efficiency for gas fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081231101111351.pdf
Value applied:	48.81
Justification of the choice of data or description of measurement methods and procedures actually applied :	Country specific value
Any comment:	

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

According to the baseline methodology ACM0002, the GHG emission of the proposed project within the project boundary is zero, i.e. PE_y=0.

According to the baseline methodology ACM0002, the leakage of the proposed project is not considered, i.e. LE_y=0.

Therefore, the proposed project activity emissions are zero, i.e. $PE_y + LE_y$=0.

According to the descriptions and calculation in section B. 6.1, the combined baseline emission factor of the Northeast Power Grid is:

$EF_{grid,CM,y}$=**1.1407tCO_2/MWh**

According to the Feasibility Study Report of the proposed project, the estimated annual electricity generation delivered to the power grid will be:

EG_y =**46,360MWh**

The annual emissions of the baseline scenario will be:

$BE_y = EG_y \times EF_{grid,CM,y}$ =**52,882 tCO_2**

The annual emission reductions of the proposed project will be:

$ER_y = BE_y - PE_y - LE_y =$ **52,882 tCO_2**

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

Summary of the ex ante estimation of emission reductions are provided below.

Year	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
01/11/2009-31/10/2010	**0**	**52,882**	**0**	**52,882**
01/11/2010-31/10/2011	**0**	**52,882**	**0**	**52,882**
01/11/2011-31/10/2012	**0**	**52,882**	**0**	**52,882**
01/11/2012-31/10/2013	**0**	**52,882**	**0**	**52,882**
01/11/2013-31/10/2014	**0**	**52,882**	**0**	**52,882**
01/11/2014-31/10/2015	**0**	**52,882**	**0**	**52,882**
01/11/2015-31/10/2016	**0**	**52,882**	**0**	**52,882**
Total (tonnes of CO_2e)	**0**	**370,174**	**0**	**370,174**

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

B.7.1. Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh

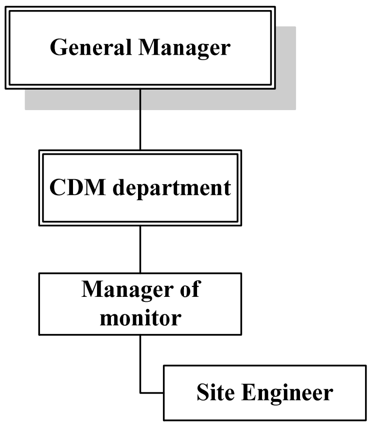
Description:	Net electricity supplied by the project activity to the grid during the year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	46,360 MWh
Description of measurement methods and procedures to be applied:	Continuously measurement and monthly recording
QA/QC procedures to be applied:	The Meters used for reading will be calibrated as per industry standards of host country (DL/T448-2000). Double check by receipt of sales.
Any comment:	

B.7.2. Description of the monitoring plan:

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

1. Management Structure

The management structure is as follows:



The general manager is in charge of decision-making on major CDM issues, the CDM department is responsible for the concrete implementation of the Monitoring Plan. The monitor manager is responsible for supervising and checking the whole date record process and the calibration of meters. Another main task of the monitor manager is facilitating the verification through providing the DOE with all required necessary information. The site engineers will collect monitoring data (e.g. electric meter data) and keep invoices of sales, etc. Before the start of the monitor, all members in the CDM department should have received well training on CDM issues.

2. Calibration and Arrangement of Meters

◆An agreement should be signed between the project owner (i.e.Hailin Longyuan Wind Power Co., Ltd.) and Power Grid Company that defines the metering arrangements and the required quality control procedures to ensure accuracy.

◆The Meter 1 (check meter) is installed at the outlet of the main transformer of the project. The Meter 2 (key meter) is installed at the entry to Lianhua 110KV switch of the grid. All the meters are the multifunctional electricity meters (accuracy degree is 0.2S, bidirectional). The electricity supplied to the grid is measured according to the key meter. In order to measure electricity when the key meter is out of order, the check meter is for backup usage.

◆The metering equipment for electricity will be properly configured and calibrated annually under the requirements of Technical Administrative Code of electric energy metering (DL/T448 －2000). The metering equipment will be checked by the project owner and Power Grid Company before operation.

◆The verification of electric energy meter should be periodically carried out according to relevant national electric industry standards or regulations. After verification, meters should be sealed. Both meters shall be jointly inspected and sealed on 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.

◆All the meters installed shall be tested by the qualified metrical agency co-authorized by the project owner and Power Grid Company, after:

1) The detection of a difference larger than the allowable error in the reading of key meter and check meter, when considering the reactive loss of electrical wire;
2) The need for repair or replacement due to the damage of the meters in whole or in parts in accordance with the specifications.

◆The project owner and Power Grid Company should have a remedial measure for the estimation of the correct reading according to agreed procedures under the signed agreement (PPA).

3. Monitoring parameters

All relevant parameters listed in Section B 7.1 will be monitored according to the methodology requirements and description of measurement methods and procedures to be applied. The net electricity supplied the grid should be measured continuously and recorded monthly as required by the methodology applied. The data and meter reading will be well documented and be readily accessible for DOE.

4. Data recording

The project owner is responsible for the operation of the check meter, and Power Grid Company responsible for the operation of the key meter, to ensure that all meters are in good conditions. If the key meter is within the limit of error, the electricity supplied to the grid monitored by the key meter will be valid and be able to achieve emission reductions calculation. Under such circumstances, the specific steps for data collection and reporting are listed below:

1) Power Grid Company and the project owner read the key meter and the check meter respectively and record readings, on a fixed day of every month;

2) Power Grid Company supplies readings to the project owner and provides relevant documents (i.e. the confirmed electricity quantity sheet). The electricity supplied to the grid is measured according to the key meter;
3) Project owner keeps the receipt, and supplies the invoice to Power Grid Company and keep a copy of the invoice;
4) Project owner provides the meter's readings, the confirmed electricity quantity sheet, and photocopies of invoices to DOE for verification.

Should any previous months reading of the meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the electricity generation supplied to the grid by the proposed project shall be determined by:

1) The project owner and Power Grid Company shall jointly prepare an estimate of the correct reading; and, provide ample evidence to DOE that the method is reasonable;
2) The check meter reading shall be for backup usage;
3) If the project owner and Power Grid Company fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.

5. Quality Assurance and Quality Control

The project activities will use high-precision monitoring equipment to monitor the electricity to the grid. Necessary check meter will be installed, to operate for backup usage when the key meter is out of order. All meters will be calibrated and sealed as per the industry practices at regular intervals. Hence, high quality is ensured. Electricity sales invoices will be used to test the consistency of the recorded data.

6. Data Management System

All parameters monitored under the monitoring plan will be archived electronically and be kept at least for 2 years after the end of last crediting period. The monitored data will be presented to the verification agency or DOE to whom verification of emission reductions is assigned.

The documents in paper format, such as maps, tables, and the EIA report, will be used in conjunction with the monitoring plan to check the authenticity of the information, and be kept at least one copy by the project owner.

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

The date of completion of the baseline study and monitoring methodology is 05/09/2008

Name of the responsible person/entity:

Zhengan CHEN, Longyuan (Beijing) Carbon Asset Management Technology Co. LTD
Address: Part C Floor 7, International Investment Building, No.6-9 Fuchengmen North Street, Xicheng District, Beijing 100034
Telephone: +8610-66091320
Email: zhengan902@126.com

(Not the project participants listed in Annex 1)

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:

25/12/2007 (the Date of Equipment Purchasing Agreement signed)

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

19 years and 0 month

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

C.2.1. Renewable crediting period

Renewable crediting period is chosen

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

01/11/2009 or the registration date whichever is later

C.2.1.2. Length of the first crediting period:

7 years and 0 month

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

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

The Environmental Impact Assessment Report (EIA) was approved on Dec 28th, 2007 by Heilongjiang

Environmental Protection Bureau.

The analysis of environmental impacts in construction phase and operation phase for the proposed project are as following:

Air

The major air pollution sources in construction phase are dust generated from constructing building foundations, tower foundations, exhaust gas from vehicles and other emissions from ordinary workers' activities. Although the construction area is dispersed, the pollution sources are intermittent, mobile and small in intensity, several measures will still be taken in order to control and reduce the air pollution. Construction management should be tightened up and construction at strong windy days should be forbidden; Water should be sprinkled on the mounds of soil exposed in the air to prevent the dust blowing. The soil dug from groundwork should be transported without delay. The velocity of vehicles should be restricted and no overloading of the vehicles should be permitted to avoid any material falling down along the way. The impact on the air quality caused by dust from use and movement of construction equipment during the construction period will be eliminated after completing the construction.

There are no air pollution sources in operation phase for the proposed project.

Water

The major wastewater emissions are mainly from domestic sewage. The domestic sewage both in construction phase and operation phase will be treated in a septic tank in the project site. The treated water can be discharged or recycled for watering the vegetation in project district.

Solid Waste

The main solid waste generated by the proposed project will be the construction waste and domestic waste. The construction waste will be use for backfilling tower and road foundations. The domestic wastes will, after collection, be transported to the designated waste disposal sites for centralized disposal. It is estimated that no adverse impact will be caused by the solid waste on the surrounding environment.

Noise

Noise will be generated by vehicles and machine equipment during construction. Measures will be taken to reduce the environmental impacts of noise to the maximum extent: choosing low-noise machines and vehicles, strengthening the maintenance of equipment, and enhancing construction management. Wind turbine units will produce noise of about 95-100dB(A) in operation phase, Noise attenuation calculation shows that at a distance of 250m from the sound source, noise decreases to 45dB(A), which satisfies well the Class 1 requirement of *Standard of Environmental Noise of Industrial Enterprises* (GB 12348-90). In addition, there are no residents within 1000 meters around the wind farm, and the background noise is high. So, the noise of the project will have no impact on nearby residents. For the operation members on the wind farm, some noise partition measures will be taken to reduce the noise impacts.

Birds and endangered species

The operation of the project may have a certain degree of influence on the migratory birds, so the attention on the flight route of migratory birds should be taken, and the operation of the wind turbines should be stopped when it is necessary in order to avoid the influence on the migratory birds.

There are no endangered species in the project region.

The proposed project activity has no significant negative influence on birds and endangered species.

Ecological aspects

The implementation of the proposed project will occupy some land and spoil some of the vegetation which will cause the soil erosion and have some negative influence on ecological environment. A series of soil and water conservation measures will be taken to control this influence: ensuring the right placement of the machinery and other facilities, big machinery are used as little as possible during the construction period, the vehicles can only go along exclusive ways, the surface soil will be preserved for backfilling during cable burying, green belt development will be undertaken all-round the project site, the temporary requisitioned land will be restored after the completion of construction by taking corresponding vegetation restoration measures, therefore, the construction of the project will put little impact on variety of local vegetation.

In conclusion, being as a typical type of clean renewable energy, the proposed project has no significant impacts on local environment and will greatly contribute to achievement of sustainable development objective and promote local environmental protection.

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:

No significant negative environmental impacts are anticipated due to the project activity.

SECTION E. Stakeholders' comments
>>

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

The comments on the project activity by the local stakeholders have been invited and complied in two ways:

1) Symposium

On May 10th, 2008, under the support of the local government, the project participants successfully held a stakeholder symposium in Hailin City. Totally 11 stakeholder representatives participated the symposium, respectively from the local Environmental Protection Bureau, Local Development and Reform Commission, local Electricity Supply Company and several villages influenced by and around the proposed project. The project participants informed them about the project, asked for their comments on the project concerning socio-economic and environmental aspects, namely as follows,

1) Impact on the economic aspect, including the local economy, income and employment, etc;
2) Impact on the environmental aspect, including the ecological environment, air, noise and the impact of soil erosion, etc;
3) Impact on sustainable development;
4) Suggestions and recommendations on the proposed project;
5) Attitude to the implementation of the proposed project, whether or not to support.

2) Questionnaire

On May 10th, 2008, the project participants have also carried out a public survey on the project in the format of questionnaires. To make sure the results more representative, all these informants came from nearby areas and covered different ages and occupations. The questionnaire was designed as following table.

Your sex: ☐Male ☐Female
Your age: ☐30 and below ☐30-40 ☐40-50 ☐50 and above
Your educational level: ☐Junior middle school and below ☐High school ☐College and above
What type of organization you work for? ☐Government ☐Enterprise ☐Agriculture ☐Others
Do you know CDM before? ☐Yes ☐No
To which extent you know the proposed project? ☐Know ☐Not know
The distance from your residence or working unit to the project site: ☐100m below ☐100-500m ☐500-1000m ☐1000m and above
Are you satisfied with the local environment? ☐Yes ☐No
What positive impacts on local region are there for the construction of the proposed project? ☐Economy ☐Environment ☐Social ☐Others
Do you think whether the proposed project will generally help develop local economy and create

new job opportunity? ☐Yes ☐No	
Do you think whether it's beneficial to local residents' income consequently? ☐Yes ☐No	
What special environmental issues should be considered in the construction of the proposed project? ☐Ecological environment ☐Waste water ☐Waste air ☐Noise ☐Solid waste ☐Soil erosion	
To which extent the proposed project will result in nature environmental pollution? ☐Nothing ☐Slightly ☐Seriously	
To which extent the proposed project has negative impact on visual environment, animals and plants? ☐Nothing ☐Slightly ☐Seriously	
To which extent the proposed project has negative impact on soil erosion? ☐Nothing ☐Slightly ☐Seriously	
Do you think whether the proposed project will help to develop local tourism? ☐Yes ☐No	
Are you satisfied with the method and amount of compensation for the occupied land? ☐Yes ☐No	
Do you think whether the proposed project will contribute to the mitigation of the GHG emissions? ☐Yes ☐No	
Do you support the proposed project? ☐Yes ☐No	
Your other comments:	
Your signature:	Date:

E.2. Summary of the comments received:

1) Summary of the comments received in the symposium:

- The proposed project has been approved by the Development and Reform Commission and Environmental Protection Bureau of Heilongjiang Province, which shows that the construction and operation of the proposed project will have little impacts on the local environment.

- All the stakeholder representatives believe that the proposed project will achieve CO_2 emission reduction by replacing electricity generated by fossil fuel fired power plants connected into Northeast Power Grid, and the proposed project will contribute to the mitigation of the GHG emissions.

- All the stakeholder representatives believe that the proposed project will have positive impacts on economy, environment and social in local region.

- The local government highly supports the proposed project, and expects the increase of local financial incoming.

- All stakeholders think that the proposed project will improve the life quality of local residents, such as, providing more employment opportunities for local residents, increasing incomes of the local residents, increasing revenues from tourism with the wind farm as a beautiful landscape, accelerate the development of local service industry, and tourism.

- All stakeholders think that the proposed project activity has no significant negative influence on local environment.

- All the stakeholder representatives support and welcome the proposed project.

2) Public survey results:

Totally 30 questionnaires returned out of 30 with a 100% response rate. Of the 30 respondents, 22 persons are male and 8 persons are female; 3 persons are younger than 30, 17 persons are 30-40 years old and 10 persons are older than 40; 4 persons are of primary school, 12 persons are of high school, 14 persons are of college and above.

Summary views on the questionnaires:

- 80% of the informants have not known CDM.
- 93% of the informants have known the proposed project.
- 100% of the informants live or work far away from the proposed project.
- 100% of the informants are satisfied with the local environment.
- 100% of the informants believe that the proposed project will have positive impacts on economy, environment and social in local region.
- 100% of the informants believe that the implementation of the proposed project will improve the life quality of local residents, by providing more employment opportunities for local residents, increasing incomes of the local residents, etc.
- 20% of the informants think that the project participants should pay attention to the problem of soil erosion, and other 13% of the informants think that the project participants should pay attention to ecological problems in the implementation of the proposed project. In this regard, the project participants will be in strict accordance with the environmental impact assessment and take environmental protection measures to ease the impact of the environment.
- 100% of the informants believe that the proposed project has no significant impacts on local environment and will contribute to achievement of sustainable development objective.
- 100% of the informants believe that the proposed project will help to develop local tourism.
- 100% of the informants are satisfied with the method and amount of compensation for the occupied land.
- 100% of the informants believe that the proposed project will contribute to the mitigation of the GHG emissions.
- 100% of the informants support and welcome the proposed project, no negative comments were received.

In conclusion, being as a typical type of clean renewable energy, the proposed project has no significant impacts on local environment and will greatly contribute to achievement of sustainable development objective, thus all the stakeholder representatives give no significant negative comments and support and welcome the proposed project.

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

No significant negative comments received. Regarding the possible impact on the environment, the project participants will be in strict accordance with the environmental impact assessment and take environmental protection measures to ease the impact.

The project participants will strictly execute the environmental protection regulations, design, construct and put into operation the environmental protection facilities simultaneously with the construction of the main project. After the completion of the project, the project participants will submit an application in written form to Heilongjiang Environmental protection Bureau for trial operation, during that time, the project participants will apply for an acceptance inspection from Heilongjiang Environmental Protection Bureau according to the stipulated procedure. If the acceptance inspection is passed, the proposed project will be put into operation officially.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project activity.

Annex 3

BASELINE INFORMATION

1. OM emission factor calculation of NEPG (Northeast Power Grid)

Table A-1, A-2, and A-3 provide annual thermal power electricity generation in NEPG from 2004 to 2006. The main data sources come from China Electric Power Yearbook 2005, 2006 and 2007.

Table A- 1 Annual thermal power electricity generation in NEPG in 2004

Province	Electricity generation （MWh)	Self usage rate （%）	Electricity delivered to the grid （MWh)
Liaoning	84,543,000	7.21	78,447,450
Jilin	33,242,000	7.68	30,689,014
Heilongjiang	53,482,000	7.84	49,289,011
Total			**158,425,475**

Data source：China Electric Power Yearbook 2005.

Table A- 2 Annual thermal power electricity generation in NEPG in 2005

Province	Electricity generation （MWh)	Self usage rate （%）	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 A- 3 Annual thermal power electricity generation in NEPG in 2006

Province	Electricity generation （MWh)	Self usage rate （%）	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.

The key parameters in OM and BM calculation include the net caloric values (NCV_s) and CO2 emission factor per unit of energy (EF_{CO2s}) of various types of fuels, which are shown in the table below:

Table A-4: NCV_s and EF_{CO2s} of various types of fuels

Fuel	NCV_s	EF_{CO2s} (tc/TJ)
Coal	20,908 kJ/kg	25.80
Washed coal	26,344 kJ/kg	25.80
Other Washed Coal[26]	8,363 kJ/kg	25.80
Coke	28,435 kJ/kg	29.20
Crude oil	41,816 kJ/kg	20.00
Gasoline	43,070 kJ/kg	18.90
Kerosene	43,070 kJ/kg	19.60
Diesel	42,652 kJ/kg	20.20
Fuel oil	41,816 kJ/kg	21.10
Other petroleum products[27]	38,369 kJ/kg	20.00
Other coked products	28,435 kJ/kg	25.80
Natural gas	38,931 kJ/m3	15.30
Coke oven gas[28]	16,726 kJ/m3	12.10
Other gas[29]	5,227 kJ/m3	12.10
LPG	50,179 kJ/kg	17.20
Refinery gas	46,055 kJ/kg	15.70

Data sources:
NCV_s are from China Energy Statistical Yearbook 2007, p287

[26] Other washed coal includes middlings and slimes. The NCV value of middlings is adopted here, which is conservative because the NCV value of slimes is higher than that of middlings.

[27] The NCV value of other petroleum products are not provided in China Energy Statistical Yearbooks. This Annex calculates it as 38369 kJ/kg, i.e., 1.3108 tce/t, on the basis of Energy Balance Sheets (physical quantity) and conversion factor against SCE.

[28] The NCV value here adopts the lower limit of the NCV value range, i.e., 16726-17981 kJ/m^3, for coke oven gas provided in China Energy Statistical Yearbook 2007, P 287.

[29] The NCV value here adopts the lowest NCV value among those for gas by furnace, gas by heavy oil catalytic cracking, gas by heavy oil catalytic thermal cracking, gas by pressure gasification, and water coal gas, which are provided in China Energy Statistical Yearbook 2007, P 287.

EF_{CO2s} are from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, table 1-3.

Table A-5: The fuel consumption and total emissions of Northeast Power Grid in 2004

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	EF_{co2}	Net caloric value	CO_2 emission（tCO_2e）
						（tc/TJ）	（MJ/t,km3）	G=D*E*F*44/12/100(quantity)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/10(volume)
Coal	10^4t	4144.2	2310.9	3084.8	9539.9	25.8	20908	188,689,377
Washed coal	10^4t	84.75	1.09	4.88	90.72	25.8	26344	2,260,872
Other Washed Coal	10^4t	577.67	14.26	61	652.93	25.8	8363	5,165,589
Coke	10^4t				0	29.2	28435	0
Coke oven gas	10^8M^3	4.83	2.91		7.74	12.1	16726	574,367
Other gas	10^8M^3	57.33	4.19		61.52	12.1	5227	1,426,677
Crude oil	10^4t				0	20	41816	0
Gasoline	10^4t				0	18.9	43070	0
Diesel	10^4t	2.04	1.16	0.24	3.44	20.2	42652	108,673
Fuel oil	10^4t	12.81	1.78	2.86	17.45	21.1	41816	564,536
LPG	10^4t	2.19			2.19	17.2	50179	69,305
Refinery gas	10^4t	9.79		1.14	10.93	15.7	46055	289,780
Natural gas	10^8M^3		0.03	2.53	2.56	15.3	38931	559,111
Other oil product	10^4t				0	20	38369	0
Other coked product	10^4t				0	25.8	28435	0
Other energy	10^4t	26.97	5.07		32.04	0	0	0
Total								199,708,287

China Energy Statistical Yearbook 2005

Table A-6: The fuel consumption and total emissions of Northeast Power Grid in 2005

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	EF_{co2}	Net caloric value	CO_2 emission（tCO_2e）
						（tc/TJ）	（MJ/t,km3）	G=D*E*F*44/12/100(quantity)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/10(volume)
Coal	10^4t	4305.41	2446.13	3383.21	10134.75	25.8	20908	200,454,896
Washed coal	10^4t				0	25.8	26344	0
Other Washed Coal	10^4t	524.74	19.26	24.16	568.16	25.8	8363	4,494,940
Coke	10^4t				0	29.2	28435	0
Coke oven gas	10^8M^3	1.03	3.57	0.68	5.28	12.1	16726	391,817
Other gas	10^8M^3	12.62	8.37		20.99	12.1	5227	486,768
Crude oil	10^4t	1.16			1.16	20	41816	35,571
Gasoline	10^4t				0	18.9	43070	0
Diesel	10^4t	1.18	1.48	0.57	3.23	20.2	42652	102,039
Fuel oil	10^4t	9.32	2.46	1.55	13.33	21.1	41816	431,247
LPG	10^4t	0.12			0.12	17.2	50179	3,798
Refinery gas	10^4t	5.48		1.32	6.8	15.7	46055	180,284
Natural gas	10^8M^3		0.84	2.24	3.08	15.3	38931	672,681
Other oil product	10^4t				0	20	38369	0
Other coked product	10^4t				0	25.8	28435	0
Other energy	10^4t	16.18			16.18	0	0	0
Total								207,254,040

China Energy Statistical Yearbook 2006

Table A-7: The fuel consumption and total emissions of Northeast Power Grid in 2006

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	EF_{co2}	Net caloric value	CO_2 emission（tCO_2e）
						（tc/TJ）	（MJ/t,km3）	G=D*E*F*44/12/100(quantity)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/10(volume)
Coal	10^4t	4681.99	2738.24	3698.29	11118.52	25.8	20908	219,912,851
Washed coal	10^4t	0.03			0.3	25.8	26344	748
Other Washed Coal	10^4t	674.74	17.83	96	788.57	25.8	8363	6,238,691
Coke	10^4t	3.32			3.32	29.2	28435	101,075
Coke oven gas	10^8M^3	2.68	0.16	1.44	4.28	12.1	16726	317,609
Other gas	10^8M^3	55.26	1.43		56.69	12.1	5227	1,314,667
Crude oil	10^4t	0.49			0.49	20	41816	15,026
Gasoline	10^4t				0	18.9	43070	0
Diesel	10^4t	0.75	0.39	0.3	1.44	20.2	42652	45,491
Fuel oil	10^4t	11.73	0.45	1.44	13.62	21.1	41816	440,629
LPG	10^4t				0	17.2	50179	0
Refinery gas	10^4t	8.55		4.27	12.82	15.7	46055	339,888
Natural gas	10^8M^3		0.19	2.1	2.29	15.3	38931	500,143
Other oil product	10^4t				0	20	38369	0
Other coked product	10^4t				0	25.8	28435	0
Other energy	10^4t	12.16	17.6	82.77	112.53	0	0	0
Total								229,226,818

China Energy Statistical Yearbook 2007

Table A-8: OM factor of Northeast Power Grid

Years	Thermal generation delivered to NEPG (MWh)	The emissions from NEPG (tCO2)	OM (tCO2/MWh)
	A	**B**	**C=B/A**
2004	158,425,475	199,708,287	1.260582
2005	164,164,426	207,254,040	1.262478
2006	183,890,005	229,226,818	1.246543
Average OM	506,479,906	636,189,145	**1.256099**

2. BM emission factor calculation of NEPG.

Table A-9 Emission factor of the unit applying best commercially available technology

Technology	Electricity supply efficiency	EF_{co2} (tc/TJ)	Emission factor (tCO2/MWh)
	A	**B**	**C=3.6/A/1000*B*44/12**
Coal fired plant	37.28%	25.8	$EF_{Coal,Adv}$ =**0.9135**
Gas fired plant	48.81%	15.3	$EF_{Gas,Adv}$ =**0.4138**
Oil fired plant	48.81%	21.1	$EF_{Oil,Adv}$ =**0.5706**

Table A-10 Calculation of the respective percentages of CO2 emissions from coal fired power generation, oil fired power generation, and gas fired power generation against total CO2 emissions from fossil fuel fired power generation

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	EF_{co2}	Net caloric value	CO_2 emission（tCO_2e）
						（tc/TJ）	（MJ/t,km3）	G=D*E*F*44/12/100(quantity)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/10(volume)
Coal	10^4t	4681.99	2738.24	3698.29	11118.52	25.8	20908	219,912,851
Washed coal	10^4t	0.03			0.03	25.8	26344	748
Other Washed Coal	10^4t	674.74	17.83	96	788.57	25.8	8363	6,238,691
Coke	10^4t	3.32			3.32	29.2	28435	101,075
Sub-total								**226,253,365**
Crude oil	10^4t	0.49			0.49	20	41816	15,026
Diesel	10^4t	0.75	0.39	0.3	1.44	20.2	42652	45,491
Fuel oil	10^4t	11.73	0.45	1.44	13.62	21.1	41816	440,629
Other oil product	10^4t					20	38369	0
Sub-total								**501,146**
Natural gas	10^7M^3		1.9	21	22.9	15.3	38931	500,143
Coke oven gas	10^7M^3	26.8	1.6	14.4	42.8	12.1	16726	317,609
Other gas	10^7M^3	552.6	14.3		566.9	12.1	5227	1,314,667
LPG	10^4t					17.2	50179	0
Refinery gas	10^4t	8.55		4.27	12.82	15.7	46055	339,888
Sub-total								**2,472,307**
Total								**229,226,818**

China Energy Statistical Yearbook 2007

With the above table and formula (5), (6), and (7), the following results are achieved:

λ_{coal} =98.70% λ_{oil} =0.22% λ_{gas} =1.08%

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =**0.9074 tCO2/MWh**

Table A-11: Capacity addition in the Northeast Power Grid

	Installed capacity in 1999（MW）	**Installed capacity in 2000（MW）**	**Installed capacity in 2006（MW）**	**Addition capacity（MW）**	**Addition share（%）**
	A	**B**	**C**	**C-B**	
Thermal	27,136.9	28,932.5	36,216	7,283.5	87.57%
Hydro	5,522.7	5,600	6,126	526	6.32%
Other	22.9	43.9	552	508.1	6.11%
Total	32,682.5	34,576.4	42,894	8,317.6	100%
Share of 2006 installed capacity	76.19%	80.61%	100%		

Data sources: China Electric Power Yearbook 2000-2007

$EF_{grid,BM,y} = EF_{Thermal,Adv} \times CAP_{Thermal,addition} / CAP_{Total,,addition}$ = 0.9074×87.57%=**0.7946 tCO2/MWh**

3. The combined emission factor calculation of the Northeast Power Grid

Table A-12: Combined emission factor of Northeast Power Grid

OM factor (tCO2/MWh)	1.256099
BM factor (tCO2/MWh)	0.7946
CM factor (tCO2/MWh) **CM**=0.75***OM**+0.25***BM**	**1.1407**

4. Emission reduction calculation of the proposed project

$ER_y = BE_y - PE_y - LE_y =$ 46,360MWh × 1.1407 tCO2/MWh = **52,882 tCO_2**

Annex 4

MONITORING PLAN

No appended information.

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